

AMERICAN LOBSTER FISHERY MANAGEMENT PLAN

New England Fishery Management Council
Suntaug Office Park, 5 Broadway
Saugus, Massachusetts 01906

March 1983

AMERICAN LOBSTER FISHERY MANAGEMENT PLAN

New England Fishery Management Council
Suntaug Office Park, 5 Broadway
Saugus, Massachusetts 01906

March 1983

AMERICAN LOBSTER FISHERY MANAGEMENT PLAN

SUMMARY

The New England Fishery Management Council has prepared the American Lobster Fishery Management Plan (the FMP) under the authority of the Magnuson Fishery Conservation and Management Act. The FMP supports the fishery management efforts of the States by implementing a unified regional program within the waters under the jurisdiction of the federal government. These measures are based upon the recommendations of the Northeast Marine Fisheries Board, which have already been adopted by the majority of lobster-producing states. By extending established management practice to the Fishery Conservation Zone (FCZ), the FMP serves to enhance the efficacy of lobster management throughout the region.

A lobster management program is necessary because the resource is fished very intensively throughout its range, resulting in only a small fraction of American lobsters surviving long enough to reproduce once. Such a condition in the resource increases the risk of recruitment failure and stock collapse, and jeopardizes the continuation of a viable fishery. Although catch has remained relatively constant in the American Lobster fishery, catch per unit of effort has been on a steady decline for more than twenty-five years.

MANAGEMENT UNIT

The fishery management unit for this FMP is the American lobster resource in the FCZ off the Northeast coast of the United States. The measures of the FMP are considered appropriate for all components of the resource, including those under state and other national jurisdictions.

OBJECTIVE

To support and promote the development and implementation, on a continuing basis, of a unified, regional management program for American lobster (Homarus americanus), which is designed to promote conservation, to reduce the possibility of recruitment failure, and to allow full utilization of the resource by the United States industry. The management program should be sensitive to the need to minimize social, cultural and economic dislocation.

MANAGEMENT MEASURES

Optimum Yield: That amount of American lobster harvested under the conservation and management measures specified in the American lobster fishery management program. TALFF and JVP equal zero.

Minimum Size: Beginning January 1, 1985, the possession or landing of American lobsters with a carapace length smaller than 3-3/16 inches shall be prohibited.

Mutilated Lobsters: Upon Plan implementation, the landing and/or possession of lobster meat shall be prohibited. Until December 31, 1985, the landing or possession of lobster tails with a sixth abdominal segment smaller than 1-1/16 inches shall be prohibited, and only two claws per tail may be possessed or landed. After January 1, 1986, the landing or possession of lobster parts shall be prohibited.

Berried Females: The landing or possession of berried female lobsters, or female lobsters from which eggs have been forcibly removed, is prohibited.

Escape Vents: Beginning January 1, 1985, all lobster traps must be constructed so as to contain one of the following: (1) a rectangular escape vent with an unobstructed opening not less than 1-3/4 inches (44.5 mm) by 6 inches (152.5 mm); or (2) two circular escape vents with an unobstructed opening not less than 2-1/4 inches (52.2 mm) in diameter; or (3) such other vent as the Regional Director may find is consistent with the above. All lobster traps and buoys must be marked with the vessel's Official Number, or, if the vessel is licensed under a State program that is approved by the Regional Director in lieu of a federal permit under §649.4(a), the State license number.

Gear Conflicts: No gear conflicts measures are proposed at this time. The Mid-Atlantic and New England Fishery Management Councils are in the process of preparing gear conflicts provisions, which will be subject to public review before adoption by the Councils. It is expected that these would not be in effect until at least 1984.

V-Notching: Possession of V-notched lobsters is prohibited north and east of a line beginning at a point 43°06'N, 70°34'W; thence to a point 42°00'N, 69°35'W; thence due east along the 42nd parallel to the outer limit of the FCZ.

Permits and Data: Permits for fishing for lobsters are required, the 3-tier data collection system is adopted in principle, and data objectives are identified. However, the Regional Director is encouraged to work with the States in each of these areas to minimize unnecessary duplicative burdens.

ALTERNATIVES AND THEIR IMPACTS

Several alternatives were examined and analyzed before the Council selected the proposed management program. These included a "no action" alternative and different specifications of a minimum legal carapace length for the FCZ. In addition, the set of management measures recommended by the Northeast Marine Fisheries Board were carefully reviewed by the Council as reflecting the best current scientific judgement for conserving the lobster resource, and in particular, for the purpose of addressing the articulated concern for recruitment overfishing.

Specific conclusions of the biological and economic analyses of the management program are:

1. Within the regions of major production in the domestic American lobster fishery, the great bulk of landings result from exploitation of the newly recruiting year class. The fact that recruitment among lobster populations has persisted under such intense exploitation may possibly be explained by a biological subsidy (in the form of recruitment) from outside the traditionally exploited coastal populations. Exploitation levels among offshore (FCZ) lobster populations are, at present, probably less than half as intensive as within the inshore populations. Should all components of the lobster resource come under equally heavy exploitation without benefit of measures to insure the reproductive potential of the stock in all areas (perhaps most importantly in the FCZ), then the continued viability of the overall resource may be in significant jeopardy.
2. Because of a long history of very intensive exploitation in all coastal lobster fisheries, minor increases of the currently regulated minimum carapace lengths may have significant short-term impacts (less than one year) on catch in one or more fishery components of the overall resource complex. States having a significant participation in the offshore lobster fishery may incur substantially lower overall short-term impacts from similar management restrictions because of the history of less intensive exploitation in the offshore fishery.
3. By contrast, the potential benefits from the standpoint of average long-term resource productivity which may be achieved through regulated increases in the minimum carapace length may be substantial, particularly in the offshore fishery and in segments of the New Jersey coastal fishery.
4. Current fishing practices within the coastal New Jersey fishery relating to the landing of lobster parts, a practice which is thought to primarily involve sub-legal size classes, has been shown to drastically reduce the productivity that is potentially available from that resource component. Moreover, the heavy exploitation of sexually immature lobsters within the coastal New Jersey fishery is probably sustained only through recruitment from offshore sources.

5. Implementation of the proposed 3-3/16 inch minimum carapace length and regulated parts management measures is expected to have primarily local effects. The proposed carapace length is currently in effect in all lobster producing states except New Hampshire and New Jersey, and thus the majority of states will not be impacted by this measure. All lobster producing states except New Jersey currently regulate the possession or landing of butchered lobsters. The combination of measures will affect New Jersey and New Hampshire in varying degrees depending upon how these States implement them in their coastal fisheries.

If New Hampshire increases its legal minimum in the same time frame as proposed in the FMP (i.e., 1985), a maximum one-year revenue impact of -18% is possible. In New Jersey, however, the implementation of a 3-3/16 inch carapace length measure in 1985 will have less of an effect than the elimination of the sub-legal parts fishery in the previous year (1984). If New Jersey were to adopt the proposed measures for its territorial sea fishery in the same time frame as indicated in the FMP, the maximum one-year revenue impact could approach -32% in 1984, followed by a +81% revenue impact in 1985, the latter resulting from the recruitment of lobsters that had not been taken as parts in the previous year.

6. The only other measure in the FMP that may have an economic impact is the requirement for escape vents in traps. The only states involved in the FCZ fishery that do not already require escape vents are New York, New Jersey, Connecticut and New Hampshire. For these states the impact of this measure is expected to be a one-time installation cost, which, depending upon the method of compliance, is likely to be insignificant.

AMERICAN LOBSTER FISHERY MANAGEMENT PLAN

SUMMARY TABLE OF CONTENTS

	<u>Page</u>
PART 1: INTRODUCTION.....	1
PART 2: DESCRIPTION OF THE FISHERY.....	4
SUBPART A: THE RESOURCE.....	4
SUBPART B: FISHERY ACTIVITIES.....	7
SUBPART C: OTHER MANAGEMENT INSTITUTIONS AND PROGRAMS.....	19
PART 3: OBJECTIVES.....	24
PART 4: ALTERNATIVES AND THEIR IMPACTS.....	27
PART 5: SPECIFICATION OF THE MANAGEMENT PROGRAM.....	33
PART 6: CONSISTENCY WITH OBJECTIVES AND NATIONAL STANDARDS.....	45

DETAILED TABLE OF CONTENTS

PART 1: INTRODUCTION.....	1
§ 101: Overview.....	1
§ 102: Background of Plan Development.....	1
§ 103: Specification of the Fishery Management Unit...	2
PART 2: DESCRIPTION OF THE FISHERY.....	4
SUBPART A: THE RESOURCE.....	4
§ 201: The Species and its Distribution.....	4
§ 202: Life Cycle and Reproduction.....	4
§ 203: Description of Habitat.....	5
§ 204: Maximum Sustainable Yield.....	6
§ 205: Current Abundance and Future Outlook.....	6
SUBPART B: FISHERY ACTIVITIES.....	7
§ 211: History of the Fishery.....	7
§ 212: The Commercial Harvesting Sector.....	8
§ 213: The Commercial Fishery: Economic Descriptors..	13
§ 214: Processing, Marketing and Consumption.....	15
§ 215: Recreational Fisheries.....	18

Table of Contents, continued.

SUBPART C: OTHER MANAGEMENT INSTITUTIONS AND PROGRAMS.....	19
§ 221: International Fisheries Programs.....	19
§ 222: Federal Fishery Management Plans.....	19
§ 223: State Fisheries Programs.....	19
§ 224: OCS Leasing.....	21
§ 225: Coastal Zone Management Programs.....	22
§ 226: Marine Mammals and Endangered Species.....	22
PART 3: OBJECTIVES.....	24
§ 301: Problems and Issues.....	24
§ 302: The Need for Federal Management.....	25
§ 303: Statement of Objectives.....	26
PART 4: ALTERNATIVES AND THEIR IMPACTS.....	27
§ 401: Introduction.....	27
§ 402: Short-term Resource Considerations.....	27
§ 403: Long-term Resource Considerations.....	28
§ 404: Resource Conclusions.....	29
§ 405: Economic Considerations.....	30
§ 406: General Implications of Other Alternatives.....	30
PART 5: SPECIFICATION OF THE MANAGEMENT PROGRAM.....	33
§ 501: Introduction.....	33
§ 502: Optimum Yield.....	33
§ 503: Domestic Annual Harvest and Total Allowable Level of Foreign Fishing.....	33
§ 504: Domestic Annual Processing and Joint Venture Processing.....	34
§ 505: Minimum Size.....	34
§ 506: Mutilated Lobsters.....	35
§ 507: Berried Females.....	36
§ 508: Escape Vents.....	36
§ 509: Gear Conflicts.....	37
§ 510: V-Notching.....	37
§ 511: Permits and Enforcement.....	39
§ 512: Data Collection.....	40
§ 513: Other Measures Not Included.....	42
§ 514: Continuing Fishery Management.....	42
§ 515: Research Needs.....	43
PART 6: CONSISTENCY WITH OBJECTIVES AND NATIONAL STANDARDS.....	45
§ 601: Consistency with Management Objectives.....	45
§ 602: Consistency with National Standards.....	45

PART 1

INTRODUCTION

§101 Overview

The United States has declared management authority over the fishery resources, including the American lobster (Homarus americanus), that occur in the area designated as the Fisheries Conservation Zone (FCZ). The FCZ has as its inner boundary the seaward limit of the coastal states and as its outer boundary a line parallel to, and 200 nautical miles from, the baseline from which the territorial sea is measured. This authority became effective on March 1, 1977, pursuant to Public Law 94-265, as amended, the Magnuson Fishery Conservation and Management Act (MFCMA, or, Magnuson Act). Under the Magnuson Act, the United States assumes responsibility for the establishment of management plans and policies, and the enforcement of regulations which implement the provisions of such plans and policies. Fisheries management must be conducted in a manner that will provide the greatest overall benefit to the nation from the harvesting and utilization of those resources.

Under the Magnuson Act, the lobster resource beyond the territorial seas will be managed according to objectives, policies and regulations formulated by the New England Fishery Management Council in consultation with the Mid-Atlantic Fishery Management Council, and approved by the Secretary of Commerce. In this American Lobster Fishery Management Plan (FMP) these objectives and policies are translated into management measures designed to achieve optimum yield (OY) from the fishery. The optimum yield is based on the best available scientific information. Recognizing the practical realities of how the resource is fished and the jurisdictional limitation of federal management to the FCZ only (i.e., excluding the territorial sea), OY is sensitive to the potential for overfishing and it incorporates considerations of biological, social, economic and environmental factors in determining the greatest overall benefit from the lobster fishery.

The FMP also establishes the expected domestic annual harvest (DAH) of the lobster resource, and in relation to the OY and the objectives adopted for management defines any surplus that may be made available for harvest by foreign vessels (TALFF). Once approved, the FMP becomes the vehicle by which the Department of Commerce regulates the American lobster fishery within the FCZ.

§102 Background of Plan Development

Since the 1950's and particularly during the last decade, rising prices and increasing demand for lobsters have resulted in a substantial increase in levels of applied fishing effort throughout the lobster fishery in the United States. Considering the number of traps fished as a rough index of applied effort, the coastal trap fishery has more than tripled over the last 20 years to a current level of more than 2 million traps. The offshore fishery, which was identified and began to intensify in the early 1960's, extends over much of the continental shelf and in the offshore canyons, from the Virginia capes to the Northeast Peak of Georges Bank and parts of the Gulf of Maine.

Lobster fisheries occur within the areas of authority of the New England and Mid-Atlantic Fishery Management Councils in the FCZ, as well as within the territorial waters of the coastal states from Maine to Delaware. Important quantities of lobsters are landed at ports in each of the 10 coastal states from Maine to Virginia. Available statistics indicate that approximately 75-80 percent of the total U.S. harvest currently comes from waters under the jurisdiction of the various States, principally Maine, with the remaining 20-25 percent being taken in the FCZ.

It has been estimated that the current level of fishing is substantially in excess of that which would provide the greatest productivity from the lobster fishery. Perhaps more importantly, the increased exploitation in the offshore fishery, coupled with the already intense inshore exploitation, has raised major concerns about the long-term viability of the overall fishery in relation to stock and recruitment. These concerns for possible recruitment overfishing and possible future recruitment failure have been the principal factors motivating the development of management programs for the American lobster.

Since 1972, the Northeastern States along the Atlantic seaboard have cooperated under the auspices of the National Marine Fisheries Service's (NMFS) State-Federal Fisheries Management Program to coordinate lobster conservation and management measures among the lobster-producing States. In 1972, a policy group which came to be known as the Northeast Marine Fisheries Board was formed to provide overall policy guidance for fishery management programs developed under the State-Federal Program in the Northeast Region of NMFS. Upon completion of the plan in 1978, the Board referred the plan to the concerned States for consideration and implementation under their respective fishery management systems, and to the New England and Mid-Atlantic Fishery Management Councils for implementation under the Magnuson Act. The Assistant Administrator for Fisheries, NOAA, had previously designated the New England Council as the agency responsible for preparation of the FMP for American lobster.

§103 Specification of the Fishery Management Unit

The American lobster resource off the Northeast coast of the United States exists from the Gulf of Maine southward to Cape Hatteras, and is considered to comprise a single stock. This argues for a single unified management program. Because the Magnuson Act generally preserves the jurisdiction of the States over fisheries within State waters, and because the lobster fishery is not engaged in predominately within the FCZ, it is critical that federal lobster management efforts be carefully coordinated with those of the States both in determining and implementing policy.

Therefore, the Council believes that its appropriate role in this fishery is to provide for regulations in the FCZ which complement those already implemented by a majority of the States within their territorial waters, and to provide a forum for the continued development of sound long-range fisheries policy for the management of this valuable regional fishery resource. The management program recommended by the Northeast Marine Fisheries Board is

widely accepted by the States in the Northeast. Its underlying policies are consistent with the policies of the Magnuson Act and the Council's perceptions of how lobsters should be managed in the current environment.

The purpose of this FMP, therefore, is to insure that a unified regional program is fully implemented within waters under the jurisdiction of the federal government. However, since the management program established by this Plan is designed to be a part of an overall unified cooperative management program, the fishery management unit for this FMP is specified as all American lobsters throughout the range of the resource.

PART 2

DESCRIPTION OF THE FISHERY

This Part draws upon, summarizes and highlights information presented in more detail in Section 4 of the Environmental Impact Statement for the American Lobster Fishery Management Plan (EIS). The reader is referred to that Section of the EIS for further elaboration of any item in this Part of the FMP.

SUBPART A: THE RESOURCE

§201 The Species and its Distribution

The American lobster (Homarus americanus) is widely distributed over the continental shelf of the western North Atlantic ocean. It belongs to a group of decapod crustaceans called "clawed lobsters." It lives on the bottom, and has a shrimp-like body and ten legs, two of which are enlarged to serve as crushing and gripping appendages.

Along the inshore waters, the American lobster ranges from Labrador to Virginia; and along the outer continental shelf and slope it ranges from Georges Bank to North Carolina. It has been found in waters of the intertidal zone, and as deep as 700 meters (about 2,300 feet). In the United States there are two principal areas of harvest: the inshore waters from Maine to New Jersey out to a depths of from 40 to 100 meters (about 130 to 300 feet); and the continental margin from Corsair Canyon to Cape Hatteras in depths of 100 to 600 meters (about 300 to 2,000 feet). The inshore areas account for the greater share of the production (about 83% in 1978).

There may be numerous local populations of lobsters indigenous to embayments in inshore areas as well as the offshore canyons on the continental margin. Maximum separation between these lobster populations appears to occur during the winter months. To some degree, differences between discrete populations may be identified on the basis of rates of growth and natural mortality which likely reflect ecological differences. However, the dispersion of lobster larvae in water currents and seasonal migratory movements of adults has probably resulted in genetic homogeneity among all American lobsters wherever they are found. Thus, there is no clear evidence for defining the management unit in terms of separate stock units.

§202 Life Cycle and Reproduction

Newly-hatched lobsters go through a free-swimming, larval stage during the first three molts, or for about 10-20 days. At this time they are planktonic and disperse according to the prevailing water movements. After the third molt the larvae resemble the adults and begin to seek the bottom.

Growth and reproduction are keyed around the molting cycle. The lobster is encased in a hard external skeleton that provides protection and body support. The skeleton is cast off periodically, which allows the body size to increase and mating to take place.

Lobsters molt about 20 to 25 times between hatching and sexual maturity. Ten of these molts are during the first year, and by age five they average one per year. Lobsters reach legal, commercial size after five to seven growing seasons, depending on water temperature. After sexual maturity, females molt and carry eggs in alternate years so that the molt frequency of the female may be only half that of the male; and older females tend to be smaller than males.

Mating occurs when the female is soft-shelled after molting. Sperm is deposited and stored until the eggs are laid, which can be up to two years. When the eggs are laid, they are fertilized and attached to the underside of the tail, where they are carried for 10 to 11 months. Females are called "berried" during the time they are carrying the eggs. Hatching occurs in the spring as water temperatures rise to about 15°C, usually from mid-May to mid-June.

§ 203 Description of Habitat

Lobsters can live in a wide variety of habitats, but usually require a crevice or burrow where they can obtain refuge. A wide variation in population density and size distribution from one location to another can be attributed to habitat characteristics as well as effects of the fishery. The sandy bottom with overlying rock of the inshore Gulf of Maine seems to support the highest population density of lobsters, although bedrock/rock, mud/rock, and mud/silt substrates also provide suitable habitat. In areas that are not rocky, lobsters dig burrows into mud and clay to seek protection.

Temperature has the most obvious environmental effect on lobsters. Many commonly-observed characteristics, such as growth, activity and distribution are influenced by water temperature. Although lobsters can withstand a wide range of water temperatures and thermal shock, growth, yield, size at sexual maturity, movement, dormancy and many other biological attributes will vary by location or season depending on temperature change.

Only extremely low salinity and oxygen levels are detrimental to lobsters, and these are rarely found in normal lobster habitats. Lobsters are sensitive to certain pollutants, such as pesticides and insecticides. Heavy metals are lethal at fairly low concentrations.

Many studies have been done concerning the effects of crude oil on lobsters. Larval forms are particularly sensitive since oil occupies that portion of the water column -- the surface -- where they occur. Oil pollution also severely and negatively effects the unicellular food organisms critical to larval lobsters.

Oil pollution has been shown to affect feeding habits of adult lobsters. For instance, laboratory studies have shown that the period between first noticing food and going after it is increased as a consequence of oil in the environment. Because of changes in feeding and other behavior, it is possible that crude oil will interfere with the ability of male lobsters to detect sex pheromones released by female lobsters, which could interfere with reproductive success.

Drilling muds are also potentially problematic since they typically contain potentially lethal components such as petroleum hydrocarbons, asphalts, aromatic lignosulphates, heavy metals and calcium-like cations such as barium and strontium. Observed reactions of lobsters to these include, depending on the concentrations, impaired coordination, cessation of feeding, loss of mobility and death.

§ 204 Maximum Sustainable Yield

Although these estimates must be considered preliminary, maximum sustainable yield has been estimated separately for the entire lobster population (14,800 metric tons), and for inshore and offshore subpopulations (12,300 metric tons and 3,600 metric tons, respectively). It should be noted that although the sum of MSY for the two subpopulations (15,900 metric tons) is larger than the estimate for the overall population, the difference is not significant, since the model which is used has its limitations, as does the catch and effort information the model uses. (Further specification of MSY may be found in the EIS, Section IV.A.)

§205 Current Abundance and Future Outlook

There is reason to be concerned about the future outlook for the American lobster resource. Catches in recent years (1978-1980) have been the highest in history. Over the past thirty years, total landings have increased by about 40%, whereas total effort, in terms of total numbers of traps, has increased four-fold. Although total numbers of traps may not be an entirely satisfactory measure of effort, it is the only measure which is available for the entire fishery. Fishing mortality rates in this fishery, as determined from tagging studies, may be the highest for any marine fishery in the United States. Available data suggests that current high harvest levels have resulted from increased effort rather than a significant improvement in resource abundance.

Yield per recruit for lobsters typically increases very rapidly with increases in fishing mortality, but then decreases with further increases in fishing mortality. Estimates of current fishing mortality are higher than the rate which would result in maximum yield per recruit. This implies that the total yield by weight from the fishery could be increased with reductions in the fishing mortality rate, although such gains would require very substantial reductions in the fishing mortality rate.

An analysis of size at maturity indicates that current size limits enforced by the States are smaller than the sizes at which 50% of the female lobsters are berried. Current minimum sizes approximate the sizes at which females first become berried. The 50% maturity level (L₅₀) varies from area to area:

	Maine	Long Island Sound	Narragansett Bay Rhode Island Sound	Offshore Virginia	Offshore Southern New England
L ₅₀	102 mm 4.0 in	87 mm 3.4 in	98 mm 3.9 in	105 mm 4.1 in	100 mm 3.9 in

The method which was used (see EIS, §IV.A., Size at Maturity, for details) may have overestimated the L₅₀ value for Long Island Sound. Other work suggests that the 50% maturity level for Western Long Island Sound female lobsters is about 75-77 mm (3.0 in), carapace length.

Although it is generally believed that any increase in the average size of lobsters harvested would have conservation benefits, there is no defined stock-recruitment relationship for the American lobster. Analysis of a possible stock-recruitment relationship is complicated by migratory activity among adults and dispersion of lobster larvae by water currents. Recruitment to the intensively harvested populations in the coastal areas in the Gulf of Maine may be supported from other areas, e.g., Georges Bank and the central Gulf of Maine.

It is probably more likely that the strength of lobster recruitment is the result of a host of factors including ecological conditions, as well as the biological elements which stock-recruitment formulations attempt to capture. The size of the spawning stock should not be ignored just because its effect on recruitment may be masked by other variables. But it is also clear that there is substantial room for improving the understanding of the relative importance of ecological and biological factors which may play a role in determining the strength of lobster recruitment.

SUBPART B: FISHERY ACTIVITIES

§ 211 History of the Fishery

Commercial lobster fishing goes back to pre-Revolutionary days, but expanded rapidly during the latter half of the 19th century. In 1880 total landings in the United States were 9,208 MT. By the turn of the century, Maine had become the leading lobster-producing State.

A lobster canning industry existed in Maine from about 1840 until 1895 when Maine adopted a law which prohibited the taking of lobsters less than 10.5 inches in total length (about 2.9 inches carapace length). This law was adopted because the live lobster industry persuasively lobbied for it, claiming that it was needed in order for the industry to get the highest price for its product. After its passage, canners could no longer compete with live lobster dealers because they could not afford to pay for lobsters large enough to be sold on the live market. Although the live lobster industry may have argued for the 1895 minimum size increase as a conservation measure, the law was adopted for economic and political reasons rather than for its value as a conservation measure.

The fishery was predominantly conducted with traps. Although the fishery fluctuated in the first half of this century, the number of traps being fished remained fairly constant from 250,000 to 350,000. However, in the post World War II era, and particularly during the 20-year period from the late 1950's to the late 1970's, the fishery expanded rapidly. During that period, the number of traps fished in the traditional coastal fishery grew to a record high of 2.1 million traps in 1978.

In addition, a new fishery developed offshore. Although offshore trawlers were known to harvest some lobsters in earlier times, the fishery remained essentially a shoal-water, coastal trap fishery well into the 1950's. Increased demand for lobster and improvement in the technology of mobile gear stimulated rapid development of an otter trawl fishery for lobster, principally around the canyon areas located in deep water along the continental margin off Southern New England. Reported landings on trawl-caught lobsters grew from 128 MT to 2,500 MT between 1950 and 1965. The new fishery rapidly expanded to an offshore area ranging from Corsair Canyon on the eastern margin of Georges Bank to Norfolk Canyon off the Virginia Coast. However, after peaking at almost 3,200 MT in 1970, the trawl landings declined to about 600 MT in 1976, as effort was shifted to the offshore trap fishery.

Success of the offshore trawl fishery and the advent of hydraulic trap haulers during the 1960's stimulated the development of deep water trap fishing technology. During the late 1960's the deep water trap fishery expanded rapidly, but in the early 1970's, serious economic problems were experienced from initial overcapitalization and from gear conflicts principally with distant water trawl fleets. During the mid-1970's, the deep water trap fishery extended across the continental shelf in the area from Massachusetts to New Jersey and along the shelf edge from Lydonia Canyon to Norfolk Canyon. Annual landings from the offshore lobster trap fishery have fluctuated between 2,000 MT and 3,000 MT.

The three tables on the following pages summarize the history of landings from the fishery, the distribution of landings in 1979 between the coastal and offshore fisheries, and the total landings and value by State for three recent years.

There is no history of a directed foreign fishery for American lobsters in the FCZ. In 1974, they were declared by the United States to be creatures of the continental shelf, reserved for domestic harvest only. However, there was some incidental catch of lobsters in the foreign trawl fisheries, though it was unlawful for the foreign vessels to retain them.

\$212 The Commercial Harvesting Sector: Socio-cultural Descriptors

Total landings of American lobster in the United States reached a high in 1981 of 17,004 MT, valued at \$86.5 million. Although the price per pound has risen substantially in recent years, gains have barely kept pace with the rise in prices throughout the economy. Maine is the leading lobster-producing State, with 59% of total landings. Massachusetts accounts for 26% of landings, and Rhode Island for 6%.

Table 1: U. S. Commercial Lobster Commercial Catch and Effort,
Territorial Sea and FCZ Combined

Year	Trap Catch (mt) (thous. lb)		Traps (10 ³)	Catch/Effort Indices (kg/trap) (lb/trap)		Total Catch (mt) (thous. lb)		Total Effort (10 ³ Traps)
1942	5558	12253	278	19.99	44.08	5577	12295	279
1943	7421	16361	304	24.41	53.82	7450	16424	305
1944	8094	17844	326	24.83	54.74	8130	17924	327
1945	10274	22650	478	21.49	47.39	10307	22723	480
1946	10984	24216	587	18.71	41.25	11012	24277	589
1947	10801	23812	674	16.03	35.33	10850	23920	677
1948	9390	20701	617	15.22	33.55	9519	20986	625
1949	11128	24533	612	18.18	40.09	11183	24654	615
1950	10394	22915	579	17.95	39.58	10521	23195	586
1951	11680	25750	513	22.77	50.19	11767	25942	517
1952	11194	24679	545	20.54	45.28	11351	25025	553
1953	12477	27507	569	21.93	48.34	12749	28107	581
1954	12080	26632	628	19.24	42.41	12465	27481	648
1955	12649	27886	675	18.74	41.31	13132	28951	701
1956	11515	25386	667	17.26	38.06	12028	26517	697
1957	13316	29357	689	19.33	42.61	13679	30157	708
1958	11857	26140	754	15.73	34.67	12349	27225	785
1959	12589	27754	857	14.69	32.39	13193	29086	898
1960	13310	29344	844	15.77	34.77	14136	31165	896
1961	11622	25622	895	12.99	28.63	12700	27999	978
1962	12122	26724	909	13.34	29.40	13378	29493	1003
1963	12342	27209	867	14.24	31.38	13731	30272	964
1964	12169	26828	904	13.46	29.68	14043	30960	1043
1965	11195	24681	949	11.80	26.01	13719	30245	1163
1966	11572	25512	947	12.22	26.94	13399	29540	1096
1967	10026	22104	908	11.04	24.34	12131	26744	1099
1968	12210	26918	966	12.64	27.87	14769	32560	1168
1969	12216	26932	1062	11.50	25.36	15327	33790	1333
1970	12249	27004	1464	8.37	18.45	15489	34147	1851
1971	12769	28151	1592	8.02	17.68	15279	33684	1905
1972	13513	29791	1716	7.87	17.36	14626	32245	1858
1973	12464	27478	2185	5.70	12.58	13152	28995	2307
1974	11987	26427	2134	5.62	12.38	12945	28539	2303
1975	12897	28433	2198	5.87	12.94	13698	30199	2334
1976	13666	30128	2203	6.20	13.68	14293	31511	2305
1977	13901	30646	2216	6.27	13.83	14434	31822	2302
1978	15128	33352	2224	6.80	15.00	15653	34509	2302
1979	16440	36244	2197	7.48	16.50	16870	37184	2255

Source of landings data: Fisheries of the United States (1971-79); Fishery
Statistics of the United States, Statistical Digests (1942-1975).

Table 2: The Coastal and Offshore Catch of American Lobster
by State in 1979 in Metric Tons

<u>State</u>	<u>Coastal Trap Fishery</u>		<u>Offshore Trap and Dragger Fishery</u>		<u>Total Landings</u>
	<u>Landings</u>	<u>% of Total</u>	<u>Landings</u>	<u>% of Total</u>	
Maine	10,039	100	-	-	10,039
New Hampshire	353	100	-	-	353
Massachusetts	3,258	75	1,074	25	4,332
Rhode Island	228	22	810	78	1,038
Connecticut	366	100	-	-	366
New York	149	47	170	53	319
New Jersey	204	56	161	44	365
Delaware	4	24	13	76	17
Maryland	0	0	40	100	40
Virginia	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
Total	<u>14,601</u>	<u>87</u>	<u>2,268</u>	<u>13</u>	<u>16,869</u>

Source: Figures are based on information from National Marine Fisheries Service, Gloucester, Massachusetts.

Table 3: Total Landings and Value of American Lobster
by State in Selected Years
(In thousands of pounds and thousands of dollars, unadjusted)

<u>State</u>	<u>1972</u>		<u>1975</u>		<u>1979</u>	
	<u>Pounds</u>	<u>Value</u>	<u>Pounds</u>	<u>Value</u>	<u>Pounds</u>	<u>Value</u>
Maine	16,257	18,588	17,008	27,479	22,133	39,901
New Hampshire	674	809	480	779	780	1,362
Massachusetts	8,032	10,276	6,734	12,101	9,553	19,804
Rhode Island	3,361	4,319	3,687	6,621	2,289	5,138
Connecticut	540	777	594	1,158	808	2,068
New York	1,145	1,825	669	1,400	703	1,852
New Jersey	1,308	1,828	851	1,555	805	1,727
Delaware	22	36	27	49	36	113
Maryland	21	26	59	106	93	238
Virginia	884	1,028	91	164	1	1
Totals	32,244	39,512	30,200	51,412	37,200	72,204

Source: Fishery Statistics of the United States, 1972 and 1975.
Preliminary 1979 information from NMFS, Gloucester.

A minimal offshore fishery presently exists in Maine and New Hampshire. Massachusetts has significant coastal and offshore fisheries. From Rhode Island southward, except for Connecticut, the fishery is predominantly offshore. Information on landings specifically from the FCZ is difficult to come by, since it is apparent that many "inshore" lobstermen devote a least a portion of their effort to the FCZ. "Coastal" fisheries for lobster may extend into the FCZ, although the majority of landings come from State waters. The National Marine Fisheries Service has estimated that for 1981, 12% of the total landings (1,995 MT valued at \$11.5 million) came from the FCZ.

The total number of persons engaged in lobster fishing has increased substantially since the middle 1960's. Since 1968, the increases have been in the trap fisheries. The vast majority of persons and vessels involved in the lobster fisheries are engaged in the coastal trap fishery.

Historically, relatively few scientific studies of an anthropological nature have been completed which provide basic and comparable descriptive data (Peterson, 1977) necessary for social and cultural evaluation of fishery management plans. What data is available is difficult to apply to a broad range of situations. Although many local and subregional social and cultural studies of fishing communities now exist, which present valuable information concerning ethnicity, age, education, employment patterns, etc., what is lacking is a conceptual framework and specific criteria for evaluating such information within the established fishery management decision process. Nonetheless, some generalized, qualitative statements can be made.

Lobster fishing is largely seasonal. Winter weather increases gear losses and makes trap hauling difficult and dangerous, particularly for small vessels. Lobsters are not as available to the fishery in the winter. Thus, there generally are some lobstermen who fish full-time for lobster, i.e., virtually all year with virtually all of their income from lobstering; there are others whose lobstering is a regular but seasonal part of a diverse fishing enterprise; and there are others who are part-time fishermen with other principal employment.

In the inshore fishery, for example, some lobstermen fish for other species during the winter, while a great many others alternate their fishing with seasonal outside jobs. Probably less than half of the lobstermen operate full-time. Year-round lobstermen are in the minority, and the seasonal lobstermen are responsible for a major part of the harvest. Lobstering may not require a large initial cash investment or experience, so there is considerable participation in the coastal fishery by students, retirees, and people with other primary employment. Many lobstermen participate in the fishery as a hobby or avocation, and derive little or no net income from the fishery.

In the offshore fishery, because of the magnitude of the necessary investment, participation is limited to serious, full-time operators. Rock crab, Jonah crab, red crab and black sea bass are taken incidentally in the directed commercial lobster fisheries. In 1978, slightly over 2.5% of the value of the offshore trap fishery came from species other than lobster. In the Mid-Atlantic area, black sea bass is the most important by-catch species to inshore pot fishermen (2.8%), while Jonah crab is the most valuable by-catch to offshore pot fishermen (1.8%). Similarly, lobster may frequently figure significantly as a by-catch in directed fisheries for other species.

Gear conflicts are a constant fact of life in the lobster trap fishery. Often traps are destroyed by draggers. The most significant conflict occurs with longlines, trawlers and scallop dredges. Lines joining traps in the offshore fishery are often snagged by draggers or by longline fishermen.

§ 213 The Commercial Fishery: Economic Descriptors

Investment. There is no published information on the magnitude of current investment in the lobster fishery. However, some estimates can be made by extrapolating from older data.

Investments in coastal lobster fishing enterprises can be as small as the purchase of a few traps and a small outboard motor boat, costing from \$2,000 to \$3,000; or as large as \$85,000 for a brand new fully equipped vessel with hundreds of traps. If each of the approximately 10,000 vessels in the fishery is considered an enterprise consisting of boat, equipment, traps and shore facilities with an average value of \$16,000, then investment in this fishery is on the order of \$160 million.

In the offshore fishery, traps are fished in trawl lines of varying lengths, from as few as twenty to as many as one hundred traps each. When the value of traps, lines, buoys and radar reflectors is totaled, a single string can be worth up to \$10,000. Offshore vessels cost from \$250,000 to \$750,000. Some vessels are Gulf shrimpers which have been converted. Using a value of \$250,000 for a typical vessel presently in the fishery, and \$50,000 for gear, the investment in an individual enterprise can be estimated at \$300,000. For the offshore trap fishery as a whole, this implies an investment on the order of \$34 million, not including shore facilities such as storage tanks, maintenance shops or piers.

The offshore dragger fishery, using an average investment estimate of \$350,000, would imply a total investment of \$8 million. This is misleading, however, because the equipment is easily converted for use in other fisheries. The considerable fluctuation in number of vessels engaged in the fishery supports the contention that these participants and the investment are relatively mobile.

Using these figures as a base, the total capital investment in the lobster fisheries can be estimated at approximately \$202 million.

Costs and Returns. Gross revenues from the fishery can be estimated by landings value, which for 1979 was \$72.2 million. The most significant variable cost is fuel. Increases in prices of petroleum also affect the cost of manufacturing fishing gear.

In the coastal trap fishery, gross revenue ranges from only a few hundred dollars, to as much as \$50,000 for a few full-time operators. An approximate average for the group is obtained by dividing the total catch value of \$62,458,000 among 10,325 enterprises yielding \$6,049 per enterprise. It should be emphasized that in the coastal trap fishery the variation in individual gross revenues is extremely wide.

Gates and D'Eugenio (1975) discussed the returns to fishermen in the Massachusetts inshore fishery. Their findings suggest that returns to labor and capital are frequently below what would be expected in other industries. Many lobstermen view the fishery as a means to create a job for themselves and perhaps a crew and to enjoy an independent work style. Many continue long established family traditions. The fishery provides a nearly unique opportunity for rewarding self-employment, and to build up equity in a business through continued hard work. Thus, while some lobstermen might find jobs which would pay them more, or more lucrative investments for their savings, such opportunities would likely not offer the independence, the possibility of building a business, and other important individual benefits that these persons desire.

Because most coastal lobster boats are owner-operated, returns to labor and capital are usually lumped together. If prevailing wage rates were paid in the lobster industry, many of the enterprises would operate at a loss, often a substantial one. Many of the enterprises, however, are not limited to lobster fishing, and seasonal supplements to revenue may come from involvement in winter dragging for flatfish, and spring/fall gillnet and trawl line groundfish fisheries.

In the offshore trap fishery, gross revenue ranges from \$10-20,000 for some to as much as \$350,000 for the highliners. Active year-round operators probably expect revenues from \$150-250,000. A rough average for the group is obtained by dividing the total catch value of \$7,868,640 among 60 enterprises yielding \$131,144 per enterprise.

The offshore fishery, because the boats are frequently larger and use hired labor, must by necessity generate operating revenues which cover costs. Risks to equipment in the offshore trap fishery are very high, with life expectancy of traps being one year or less. Loss of gear to foreign offshore fishing has become a significant issue in recent years. A management study of offshore trap lobstering suggested that the industry may have considerable profit potential. However, the possibility of heavy gear losses, entry of large numbers of inexperienced operators, and the lack of knowledge concerning the resource base being exploited have made the industry a risky one.

In the offshore trawl fishery, gross revenue ranges from perhaps \$20,000 for some to as much as \$200,000 for the most active. Average revenues have increased because the number of participants has declined, leaving only serious and experienced operators. A rough average for the group is obtained by dividing the total catch value of \$1,843,000 among 128 enterprises yielding \$14,398 per enterprise.

Offshore dragging is attractive because of the relatively small investment needed to adapt a groundfish vessel to lobster trawling. In most cases only the installation of some type of holding facility for the lobster is needed. The product is often of uncertain quality; as much as 30 percent of the catch can be damaged due to rough handling during the harvesting operation. In summer, a high proportion of the catch may be lost through spoilage aboard vessels not equipped with adequate storage facilities. In addition, damage to individuals which are not harvested may be considerable. For these reasons, this harvesting method is less attractive than trapping from a resource conservation standpoint. No information on returns to capital and labor exists for this fishing method. Because the investment is easily transferred to other facilities, participants in the fishery can be assumed to be operating profitably, or they would tend to leave the fishery or devote more effort to other, more lucrative pursuits.

Related Products and Industries. Although American lobster is a unique product in the marketplace, a number of alternative supplies of fisheries products with similar characteristics and appeal are available. Chief among these are spiny lobster, and crabs (blue, Dungeness, king, tanner).

Two related industries are of particular importance. The bait industry is important because it comprises a significant portion of the fisherman's variable costs. Each locality has a different preferred bait, but the species used is generally determined by availability and price. Lobstermen may use menhaden, windowpane flounder, skate, alewives, dabs, herring, cunner, sea robins, sea bass, crabs, hake and redfish. The source varies, but lobstermen often catch at least part of their own bait. Other supply comes from boats which operate a directed fishery for bait. A primary source is offal from fish houses and processors.

Another related industry is that of trap construction. Traps last an average of three years. Many lobstermen make their own traps from pre-cut materials provided in kits or by local sawmills. Approximately 30-35 firms make traps for sale, with annual sales of approximately \$4 million. Total employment is probably 120-125 persons.

§ 214 Processing, Marketing and Consumption

Processing. By far the largest portion, approximately 87 percent, of the domestic catch of American lobster is marketed live or freshly cooked at the point of final sale. The remaining portion is marketed as fresh or frozen meat which has been shucked from lobsters which become weakened or injured at various points in the distribution chain. In addition, in the Mid-Atlantic region, some lobster is marketed as lobster parts. Only a small proportion of the lobster industry does any type of processing. Although the number of steps in the distribution chain is variable by geographic region, in general the individual fisherman sells his catch to a dealer, who will hold the lobster for sale to a wholesaler. These wholesalers in turn market the lobster either to restaurants, retail outlets or institutions.

In areas such as Maine, where the coastline is marked with many protected embayments subject to tidal flushing, tidal impoundments as well as floating "lobster cars" are used to store live lobsters until they are distributed to dealers or wholesalers. A more recent and more common storage method, both for the producers and dealers at various points on the chain of distribution, is the use of circulating sea water tanks which may, depending on the climate and region, be temperature controlled.

The tidal impoundments, or lobster pounds, serve a number of purposes, depending on both the current market for lobster and the season. At times, pounds are used for extended storage of lobsters, either to allow recently molted lobsters to harden their shells, or to serve to level the market in periods of slack supply or demand. A number of large storage facilities serve a speculative purpose, holding lobster in expectation of price advances. Some pounds may recently have begun to hold lobster through molt periods when the weight and value can increase significantly. Because lobster catch is dependent on the season, pounds are used primarily to maintain a steady supply in the face of variable production rates. Lobster cars and tanks serve as short-term storage facilities and for holding of daily shipments to market.

Bulk lobster shipments are transported by truck and by air, in specially constructed insulated packages made of fibreboard or styrofoam. Recently, air shipment of small quantities by order to individual consumers has picked up, and the use of express air or postal delivery has drawn great interest for reducing shipping costs.

Prices. The apparent value of the lobster catch has increased steadily in recent years. In 1981, the value to the fishermen of domestic commercial landings was \$86.5 million, up from \$33.5 million in 1970. The average ex-vessel, or per pound price received by fishermen for their catch, has increased from \$.98 per pound in 1970 to \$2.31 per pound in 1981. However, if the trend in ex-vessel prices of lobster is compared to other prices, it becomes apparent that increases in lobster prices have not kept pace with the general trend, and that lobster prices have risen only a fraction of what other fishery product prices have. For example, from 1972 to 1981 the general fish price index (ex-vessel) rose 160%, whereas the ex-vessel lobster price index increased by only 108% (see EIS, Table IV.B.10.).

Vessel prices fluctuate seasonally, from a low in early fall to a high in mid-winter when fewer lobsters are taken and holiday season demand is high. Prices fall again in mid-April as supply is augmented with imports and domestic landings pick up from the winter slump.

Different sized lobsters command different prices per pound at the market, depending on the season and demand. The smallest legal sized lobsters, known as chickens and weighing about one pound, are generally the least valuable per pound next to culls or damaged lobsters, although in certain seasons (and more recently) demand for them has driven their price above that for other categories. Prices increase with the size of the lobster until a threshold size, about three pounds, is reached. Above this size, the lobster is too large for the general restaurant trade, and the price per pound decreases somewhat due to depressed demand.

At the wholesale level, lobster prices are influenced less by season. This probably reflects the action of speculative pounding and storage, seasonal augmentation of supply with imports, as well as the greater ability of wholesalers to maintain prices at a level they desire. Wholesale prices have generally been 40 percent higher than ex-vessel values, although they fluctuate.

Because a major portion of the lobster sold is served by restaurants and other institutions, the retail market and retail price are difficult to evaluate. Institutions and restaurants require generally stable or predictable supplies of lobster, which makes the quantity remaining for retail sale very sensitive to changes in landings. Thus, the retail price and availability can be highly variable, depending on fluctuations in supply.

In addition, retail prices for the live product may vary widely depending upon both season and geographic region. While lobster can be purchased by consumers at near ex-vessel prices from lobstermen in the producing coastal areas, the price in other parts of the country or in retail establishments is often several times higher.

Processed lobster prices reflect the considerable loss which occurs from live weight to meat weight of lobsters. Hard shell lobsters will yield approximately 20 percent of their weight in meat. Recently molted lobsters will yield only about 12.5 percent of edible meat. Fresh cooked meat may be worth more than 18 dollars per pound. In contrast, canned and prepared products containing relatively small quantities of meat processed from cull or damaged lobsters may sell for prices below 2 dollars per pound.

Product distribution. The distribution chain for American lobster consists of several steps. The lobsterman sells his catch to a dealer or a buyer. The dealer then sells his stock to a wholesaler. Dealers often function as wholesalers. Wholesalers and brokers market their stock either to retail outlets or to restaurants. Lobster cooperatives frequently operate as dealer-wholesalers, eliminating outside middlemen. Because few alternative outlets exist for many lobstermen, the wholesaler frequently has the ability to make the market. Wholesale prices tend to reflect differences in handling and transportation costs between the major markets, but are otherwise equalized. Because lobstermen must often deal with only one local wholesaler-dealer, and because firms at this level frequently augment their sales with imported product and maintain storage of lobsters for speculation, the wholesalers' operation has potential to be very profitable.

Markets. The lobster industry is characterized by the small number of major sellers involved. Several large New England dealers control the marketing of a significant portion of the total available production.

Although in years past the Fulton Fish Market absorbed much of the Maine and Canadian production, that situation has changed with the growth of direct air shipment of lobster from dealers and wholesalers. At present, the Boston dealers control the largest portion of the lobster market by direct shipment. The Massachusetts catch is consumed primarily in local areas or utilized by the Boston market. The other coastal states, including Rhode Island, New Hampshire, Connecticut, and New Jersey all produce less lobster than is consumed locally; thus, they rely on supplies from Maine and Canada. Considerable quantities of American lobster are marketed as far south as Miami, and with the increasing use of air transport, live American lobsters are becoming less of a rarity in the inland and west coast states. However, the New England and New York markets continue to provide the largest regional outlet -- a situation which is likely to persist in the future.

Imports. Domestic production is not sufficient to supply the great demand for American lobster in the United States, and a substantial proportion of the lobster consumed here is imported from Canada. In 1981, the United States imported the equivalent of more than 18,300 MT of live lobster in the form of fresh, frozen, canned, and prepared lobster meat from Canada. In 1978, imports amounted to 69 percent of the Canadian production of live and whole frozen lobster, 64 percent of fresh and frozen meat production, and 32 percent of canned meat production. It is obvious from available information that a substantial portion of our lobster supply is of Canadian origin, and the United States imports most of the Canadian lobster production.

With imports constituting 45 to 50 percent of the total domestic supply, development of a significant export market may seem unlikely. With the cultivation of demand for lobster in Europe, lucrative markets may become available for U.S. suppliers. Recently, there is some evidence that U.S. production is sold in Canada during periods when their fishery is closed or supply cannot meet demand. Only Canada and the U.S. can supply any quantities of American lobster. Canadian entrepreneurs have made significant progress in developing European markets.

Role of Cooperatives. Cooperatives play a very significant role in the processing and marketing of lobsters. For example, there are eighteen fishery cooperatives in the State of Maine, and virtually all deal in some aspect (marketing, purchase of supplies, processing) of the lobster fishery. Cooperatives are also very important in the lobster fisheries in Rhode Island and Massachusetts.

§ 215 Recreational Fisheries

Information on the number of recreational lobster fishermen is available only for New Hampshire, Massachusetts, Rhode Island, Connecticut and New York -- states in which a license is required to fish lobsters for recreational purposes. Recreational fisheries are conducted with a number of techniques, which include traps and diving with SCUBA equipment. While diving for lobsters is prohibited in Maine and New Hampshire, it can be an important component of the fishery in other areas. In Maine, where a license is required to fish lobsters for any purpose, all licensed lobster fishermen are

classified as "commercial". However, a number of those fishermen are known to fish for lobsters only for recreational purposes. Recreational lobster fishing occurs in New Jersey, but its importance is not known, since the state does not presently issue lobster licenses of any sort.

It is unlikely that a recreational trap fishery of any magnitude exists beyond three miles from shore. Similarly, recreational fisheries in areas south of New Jersey are unlikely due to a low availability of lobsters in the near shore waters of the states concerned.

SUBPART C: OTHER MANAGEMENT INSTITUTIONS AND PROGRAMS

§ 221 International Fisheries Programs

The American lobster has never been directly managed under international agreement. Prior to enactment of the Magnuson Act, many fisheries outside the jurisdiction of the United States (12 miles at that time) were managed under the auspices of the International Commission for Northwest Atlantic Fisheries (ICNAF). That organization established management policies and allocated harvests among member nations, but implementation and enforcement were left to the member nations. American lobsters, however, were managed by the United States rather than ICNAF, since they were declared to be "creatures of the continental shelf."

§ 222 Federal Fishery Management Plans

Fisheries for groundfish (cod, haddock and yellowtail flounder), Atlantic herring, scallops, surf clams and ocean quahogs, squid, mackerel and butterfish are currently under regulation by other fishery management plans. Fishermen fishing for lobsters are subject to these other plans if their activities are likely to result in the harvest of any of these other species. Similarly, fishing for any of these other species may subject a fisherman to the provisions of this plan if his activities are likely to result in the harvest of lobsters.

§ 223 State Fisheries Programs

Most of the fishery for American lobster in the United States occurs within state waters. Historically, each State has managed its lobster fishery independent from other States, although the need for compatible management programs has long been recognized. Table 4 presents a comparison of current State regulations.

The major State lobster regulations include: license requirements, catch/effort reporting, gear regulations, and fishing activity regulations, restrictions on the taking of berried lobsters and restrictions on the size of lobsters that can be taken. The last two of these are universally in force among the lobster-producing states. The legal minimum size (carapace length) is now nearly uniformly set at 3-3/16 inches.

Table 4: Lobster Regulations by State

	<u>ME</u>	<u>NH</u>	<u>MA</u>	<u>RI</u>	<u>CT</u>	<u>NY</u>	<u>NJ</u>	<u>DE</u>	<u>MD</u>	<u>VA</u>	<u>NC</u>
1. <u>License Requirements</u>											
no license required							X		X		X
required to fish lobster	X	X	X	X	X	X		X		X	
required to land lobster	X	X	X	X	X					X	
required to deal in lobster	X	X	X	X	X						
2. <u>Legal provisions for aquaculture enterprises</u>	X	X	X	X	X	X	X				
3. <u>Fishermen Classification</u>											
none							X		X	X	X
commercial	X	X	X	X	X	X		X			
non-commercial		X	X	X	X	X		X			
4. <u>Catch/Effort Reporting</u>											
not required							X		X	X	X
required annually	X	X	X		X	X		X			
requires daily record				X	X						
5. <u>Gear Regulations</u>											
none							X		X		
by license class:		X	X	X	X	X				X	
quantity allowed		X	X			X		X		X	
type allowed	X	X	X			X		X			
owner identification required	X	X	X	X	X	X		X			
escapement opening in catching device specified	X		X	X				X			X
6. <u>Fishing Activity Regulations</u>											
none											
by license class or method:			X	X		X		X			
number of licences			X								
catch quotas						X		X			
area	X	X	X			X					
season	X		X					X			
day or time of day	X	X	X	X	X			X			
landing of lobster meat regulated	X	X	X	X	X	X		X	X	X	X
landing of lobster parts regulated	X	X	X	X	X	X		X	X	X	X
landing of gravid female lobsters prohibited	X	X	X	X	X	X	X	X	X	X	X
landings of v-notched female lobsters prohibited	X										
landing of lobsters regulated by size (carapace length)	X	X	X	X	X	X	X	X	X	X	X
5 inches maximum allowed	X										
3 1/16 in. minimum all'd											
3 1/8 in. minimum all'd		X					X				
3 3/16 in. minimum all'd	X		X	X	X	X		X	X	X	X

Two measures implemented and enforced by the State of Maine should be noted in particular. In addition to the minimum size, Maine enforces a maximum size limit. No other State maintains this regulation. Maine also operates a V-notching program. Fishermen voluntarily cut a notch in the tail of each berried female lobster, before returning it to the water. The State also purchases berried females from pounds and returns them to the sea after notching them. It is unlawful in Maine to possess a lobster with a notch in the tail. The notch stays with the lobster through two molting cycles. Although the conservation benefit of these measures is neither proven nor disproven, they are widely accepted by the Maine fishermen as having a conservation value.

Both New Hampshire and Massachusetts, at various times in the past, had similar V-notch programs and both abolished them. One of the arguments against V-notching has been that notched lobsters may fall victim to gaffkemia and other infections and die. These concerns stem from studies in lobster pounds where population density is great and where water movement is possibly restricted, leading to higher incidence of diseases generally. It is worth noting that research indicates that a new integument forms very quickly over the edges of the cut tissue and that unless infection sets in before the integument forms, likelihood of death from infection decreases to the otherwise usual level. No adequate studies of infection in natural ocean surroundings have been done.

Over the years, there have been attempts to coordinate management practices between the states through informal cooperative agreements, but they have met with only limited success. Since 1972, the lobster-producing States of Maine through North Carolina and the National Marine Fisheries Service have cooperated under the auspices of the NMFS State/Federal Fishery Management Program to provide a uniform approach to management of the lobster fishery. All participants agreed to work toward implementation of common precepts that were developed under the program. The present emphasis within the State/Federal program is to work as quickly as possible towards the minimum carapace length of 3-3/16 inches in order to have a uniform minimum size. At present, New Hampshire and New Jersey have yet to adopt 3-3/16 inches as a minimum size, and operate under a 3-1/8 inch minimum size. In addition, New Jersey allows the landing of lobster parts, which may well come from lobsters of even smaller sizes. New York also allows the landing of tails, but imposes a minimum size requirement on them which correlates with the 3-3/16 inch requirement.

§ 224 OCS Leasing

During the Summer of 1981, exploratory drilling for oil and gas began on Georges Bank. Other sections of Georges Bank are currently proposed to be leased under the Outer Continental Shelf Lands Act. The sensitivity of lobsters to heavy metal and oil contamination was noted in Subpart A. To the extent that oil exploration is extended into prime offshore lobster habitat in the areas of the outer continental shelf and slope, adverse impacts to the offshore lobsters population could result. Contamination and disturbance of lobster habitat in these offshore areas should be minimized to avoid potential loss of production from this valuable resource.

The Council specifically notes the comments of the National Oceanic and Atmospheric Administration concerning the Draft Supplemental Environmental Statement for OCS Lease Sale 42 and believes that the recommendations contained therein should be applicable generally to OCS lease sales. The Council particularly endorses the need for site-specific studies, disposal of drilling muds in approved sites away from fish habitats, reinjection of formation waters, deletion of tracts containing important habitats for lobster and other benthic communities, and the establishment of an interagency scientific committee to provide operational assistance to the OCS Supervisor regarding actions affecting the marine environment.

§ 225 Coastal Zone Management Programs

Most of the States in the areas affected by this Plan have approved coastal zone management programs. These programs have been reviewed and no inconsistencies between them and the measures, policies and provisions of this Plan have been found. Each of the coastal programs has been specifically notified of the Council's determination in this regard.

§ 226 Marine Mammals and Endangered Species

(Material in this section relies heavily upon similar material prepared by the Mid-Atlantic Fishery Management Council for its Amendment #3 to the Fishery Management Plan for the Atlantic Mackerel, Squid and Butterfish Fisheries.)

Numerous species of marine mammals and sea turtles occur in the Northwest Atlantic Ocean. The most recent comprehensive survey in this region was done in 1979 by the Cetacean and Turtle Assessment Program (CETAP) at the University of Rhode Island. Twenty-one cetacean species and four species of turtles were encountered in the survey, which also estimated the minimum population number in the study area.

The study team concluded that both large and small cetaceans are widely distributed throughout the study area throughout the year, and grouped the thirteen most commonly observed species into three categories. The first contained only the harbor porpoise, which is distributed over the continental shelf and throughout the Gulf of Maine, Cape Cod, and Georges Bank; but is probably not found southwest of Nantucket Island. The second grouping contained the most frequently encountered baleen whales (fin, humpback, minke, and right) and the white-sided dolphin. These are found in the same areas as the harbor porpoise, and also occasionally over the shelf at least to Cape Hatteras or out to the edge of the continental shelf. The third group containing the grampus, striped, spotted, saddleback and bottlenose dolphins, and the sperm and pilot whales, showed a strong association with the shelf edge.

Loggerhead turtles were found throughout the study area, but appear to migrate north in the summer about as far as Massachusetts, and then south in the winter. Leatherback turtles appear to have a more northerly distribution. The study team hypothesized a "northward migration in the Gulf Stream with a southward return in continental waters nearer to shore." Both species ususally were found "over the shoreward half of the slope," and in less than 60 meters. No live green or Kemp's ridley turtles were found, and the latter's population has been estimated at only about 500 adults. The study area may be important for sea turtle feeding or migrations, but the nesting areas for these species generally are in the South Atlantic and Gulf of Mexico. The Council and the National Marine Fisheries Service remain concerned about turtle mortalities, particularly in Cape Cod Bay, and believe that further monitoring of turtles in New England is necessary.

In addition to the above, the only endangered species occurring in the Northwest Atlantic is the shortnose sturgeon. Data on the occurrences of shortnose sturgeon are vital to understanding its current status. The Council therefore urges fishermen to report any catch or observations of this species to the Sturgeon Recovery Project of the National Marine Fisheries Service.

Because of the nature of the gear, and lobster fishing in most of the FCZ is unlikely to result in the incidental catch of endangered species. No critical habitat areas where lobster fishing is engaged in have been identified for any endangered or threatened species or any species of marine mammal. Implementation of this plan will have no effect upon populations of marine mammals and endangered species. As additional understanding of the status and dynamics of marine mammals and endangered/threatened species becomes available, the Council will integrate this information into its examination of potential impacts upon the environment as a result of fishery management programs.

PART 3

OBJECTIVES

§ 301 Problems and Issues

The principal problem which the lobster fishery presents for fisheries management is political: there are many separate jurisdictions (eleven States and the FCZ) within which meaningful quantities of lobsters are harvested. Each of the States has a largely localized constituency to which it tries to be responsive. The actions of any of the States can undermine the effectiveness of conservation measures implemented by others, since fishermen from both areas may be fishing on the same populations and shipping into the same markets. The federal government is not in a position to prescribe and enforce policy on its own because ultimately, since the fishery is predominantly in State waters, it does not have sufficient control to insure on its own that such policies would be achieved. What is clearly needed in this fishery is a unified, cooperatively developed and implemented management regime.

There are a number of problems which any such regime should consider. The American lobster is fished very intensively throughout its range. Only a small fraction of American lobsters which are harvested from inshore areas survive long enough to reproduce even once. The fishing mortality rate is perhaps the highest of any fishery in the United States.

Although catch has remained relatively constant, catch per unit of effort has been on a steady decline for more than twenty-five years. Normally this would imply that long-term recruitment prospects should be a matter of concern to fishery managers. The problem is even more difficult in the case of lobsters because much of the effort increase has come as a result of an expansion of the fishery to offshore areas outside the parameters of the historical fishery. Thus, the offshore population is less able than in the past to act as a buffer and support the resource under intense exploitation in the coastal fisheries.

These concerns must be moderated somewhat by recognizing that:

1. despite the continued intense fishing mortality rates, inshore catches nonetheless have remained steady over a long historical period;
2. little is known about the identification of subpopulations or how subpopulations might support one another; and
3. increases in average size, which would be implied from increases in average age-at-first-harvest, may affect demand for the product.

Nevertheless, the very high fishing mortality rate, declines in catch per unit of effort and significant increases in the level of effort in the fishery raise serious concerns for the future recruitment potential of the resource.

One other problem which is particularly relevant to management in offshore areas is gear conflicts. However, this is being handled by the Mid-Atlantic and New England Fishery Management Councils through a separate administrative action, and is not dealt with in this FMP.

§ 302 The Need for Federal Management

As noted in §§ 102 and 223, the States have managed lobster resources for many years, and have worked cooperatively with the National Marine Fisheries Service in the development of a regional management program. An alternative for the Council would be the "no-action" alternative: to decide not to implement any federal management at this time, and allow State management to control the fishery. Whether this possibility could work is a particularly critical issue in fisheries such as lobster where the predominant catch comes from State waters, and thus the likelihood that independent federal policies could be effectively achieved is limited.

Federal management is necessary to control the offshore fishery along the outer continental shelf and slope from Georges Bank to North Carolina. This fishery is prosecuted entirely in the FCZ, by vessels from a number of different States. Since no one State could control the fishery, and since it is conducted within the FCZ, the Magnuson Act is the appropriate vehicle for developing and implementing effective management policy. It might even be possible to develop a plan under the Magnuson Act for this portion of the fishery alone. However this would ignore the possible biological relationship, and the obvious economic relationship, between the coastal and offshore fisheries.

A federal role in regulating fishing in the FCZ portion of the coastal fishery (i.e., beyond three miles) is necessary. Although States have the predominant interest in the fishery and the ability to regulate their vessels in the FCZ, they do not have the ability to regulate vessels from other States. Two States in the New England and Mid-Atlantic area, for example, have yet to adopt the minimum size regulation which was recommended by the Northeast Marine Fisheries Board. In addition, increased mobility of vessels and adverse circumstances in other fisheries have increased the likelihood that vessels from other regions may enter the fishery and not be subject to regulation in the FCZ by any of the States in the Northeast. Thus, even in a management program which relies heavily on the States for policy development, the States need the Council's assistance in implementing those policies in the FCZ.

The Council, as a federally-created representative of regional management interests, is also an appropriate forum to develop sound regional management policy, even if the States will be the principal jurisdictions with political responsibility for adopting and implementing that policy. Council participation in policy development gives that policy greater chance of success within the various States. Thus, while the Council recognizes that the States must take the lead in setting policy to guide management of the lobster fisheries, it will be able to assume a role as a proponent of management policy that is in the best interests of the region as a whole and the nation; and can provide a forum within which that policy can be developed.

It is therefore appropriate to implement a fishery management plan for American lobster throughout the FCZ that is part of an overall unified State/Federal management program throughout the entire range of the species. For this reason, the Council has not adopted the "no-action" alternative, or the alternative to manage only the offshore fishery.

§ 303 Statement of Objectives

The objective of the American Lobster Fishery Management Plan shall be to support and promote the development and implementation, on a continuing basis, of a unified, regional management program for American lobster (*Homarus americanus*) which is designed to promote conservation, to reduce the possibility of recruitment failure, and to allow full utilization of the resource by the United States industry. The management program should be sensitive to the need to minimize social, cultural and economic dislocation.

Comment. The American lobster resource comes from diverse offshore and inshore waters in such quantities and qualities as to suggest unique management challenges. This fact, coupled with the fact that the data base available from statistical and biological sources is not historically strong, indicates that management of this resource must go forward with great caution and flexibility. It is the intent of the Council to promote harmonious use of the resource among the various components of the American lobster fishery; and also to promote compatibility of conservation and management measures employed by the various political entities having jurisdiction over the resource.

The objective basically has two parts: the promotion of uniform management, and a substantive goal for that management. The objective recognizes the lead role which the States must play and establishes a supportive role for federal regulation. However, at the same time it notes the basic management policy which the Council believes the regional program should aim for: improving conservation and reducing the risk of recruitment failure, while allowing full utilization of the resource by the United States industry. "Recruitment failure" in this context refers to stock-induced circumstances, resulting from an inability of the stock to support itself at a viable level. The Council is concerned about prospects for continued recruitment in light of high fishing mortality and expansion of fishing effort, and will, as part of a cooperative regional management program, pursue measures designed to reduce the likelihood of recruitment failure.

The Council has reviewed the current status of State management, as developed through the Northeast Marine Fisheries Board and implemented by the States, and determined that the regional management program as it exists meets the Council's substantive goal for management. It should not be inferred from this objective that the Council would automatically support changes which the States might make to the regional program, or a failure of States to act if the understanding of resource conditions changes. The objective is realistically grounded in current jurisdictional and resource conditions. If those circumstances change, the need to provide for conservation of the resource may have to be weighted differently. However, given current resource conditions and the States' response thereto, the objective reflects the Council's judgement that what is most needed now is for the major portion of the resource that is still not subject to regulation to be managed according to the regional management program.

PART 4

ALTERNATIVES AND THEIR IMPACTS

This Part draws upon, summarizes and highlights information presented in more detail in Section 5 of the Environmental Impact Statement for the American Lobster Fishery Management Plan (EIS). The reader is referred to that Section of the EIS for further elaboration of any item in this Part of the FMP.

§ 401 Introduction

The most significant management measure considered for adoption and implementation in the lobster fishery relates to the establishment of a uniform minimum size. As a corollary to that measure, a prohibition on the landing of detached lobster parts (tails and claws) is also considered. In both the recommendations of the Northeast Marine Fisheries Board and the Council's deliberations, the minimum size has been considered ultimately the essence of the regulatory regime. Accordingly, it receives the most detailed treatment in this Part and the EIS. In this part the short-term and long-term resource implications of various alternative minimum sizes are examined, noting additionally the relationship and impacts of possible effort controls. For these purposes, three alternative minimum sizes are evaluated: 3-3/16 inches (the preferred alternative), and 1/16 inch higher and lower (3-1/8 inches and 3-1/4 inches). These will indicate the likely trends if minimum sizes were varied from the preferred alternative. For the long-term analysis, the impacts of minimum sizes greater than 3-1/4 inches will be referred to, and are set forth in more detail in the EIS. (As explained in the EIS, these cannot be analyzed for the short-term.) Two simplifying assumptions are made throughout these analyses: constant recruitment and constant fishing mortality.

Some general conclusions will be drawn from the short-term and long-term resource considerations, and then economic considerations of minimum size alternatives will be considered. Afterward, attention will be given to implications of other alternative measures, though not in the detail given to alternative minimum sizes.

§ 402 Short-term Resource Considerations

A biological analysis of short-term effects of alternative management specifications is presented in Section V.B. of the EIS. Specifically, these relate to changes in expected lobster catch levels associated with a virtual* prohibition on the landing of detached lobster tails and claws during the first year of Plan implementation (expected to be 1984), and changes in expected catch levels associated with implementation of alternative uniform size limits during the second year of Plan implementation (1985). In

* In 1984, tails must conform to a standard consistent with a 3-3/16 inch carapace length, thus eliminating the preponderance of parts known to come from sub-legal (under 3-1/8 inch) lobsters landed in New Jersey.

general, a regulated standard for the landing of parts will result in a short-term loss to those segments of the industry having current dependency upon parts from sub-legal sources, but will lead to increased catches of whole, live lobsters in the following year. In the second year of Plan implementation, increases in the minimum size will, in general, reduce legal catch levels in the short-term, whereas decreases in the minimum size will generally increase them.

Implementation of a uniform 3-3/16 inch minimum size in 1985 will result in a slight increase in total landings (+2.61%) in that year. This is attributable to decreased catches in New Hampshire (-17.10%) but a significant increase in the legal catch in New Jersey (+82.73%). The increased legal catch in New Jersey is a direct result of the virtual elimination of fishing mortality on sub-legal age classes over the previous year due to the regulated standard for the landing of lobster parts. If the reduction in the landing of lobster parts is factored in with the minimum size, then the overall impact upon New Jersey landings over the two year period 1984-1985 with implementation of a 3-3/16 inch size limit in 1985 is negative (-11.47%). See §406, and Section V.B of the EIS for more detail concerning landings; see §405 below for economic implications. Reducing the minimum size to 3-1/8 inches in the overall fishery would increase landings in 1985 at least +19.68%. Raising the minimum size to 3-1/4 inches would decrease landings in 1985 by, at most, about -12%.

§ 403 Long-term Resource Considerations

A biological analysis of the long-term effects of alternative minimum size specifications is presented in Section V.B. of the EIS, focusing on the impacts relative to yield per recruit for three major areas. Alternatives are evaluated in terms of changes from a 3-3/16 inch size limit with no control on fishing mortality. Within each area it is assumed that recruitment is constant and that growth and mortality rates are uniform.

For the coastal fishery in the Gulf of Maine, if fishing mortality continues at current rates, increasing the minimum size to 3-1/4 inches would increase yield per recruit by 5%, and double the relative number of female lobsters that may be expected to become berried before they become subject to fishing. Without addressing fishing mortality, further increasing the minimum size could increase yield per recruit as much as 80% (at a 5+ inch minimum size). Simultaneous controls on fishing mortality could provide the same increase in yield per recruit at smaller minimum sizes, or could be used to generate even larger increases in yield per recruit.

Conversely, decreasing the minimum size and/or increasing fishing mortality would have the opposite effects. If fishing mortality remains constant and the minimum size is decreased to 3-1/8 inches, long-term yield per recruit would decrease by 3.56%. If, in addition, fishing mortality increases by as much as 30%, the total decrease in yield per recruit would be approximately 5%.

Similar circumstances prevail in the coastal fishery from Southern New England southward, but to a different degree because of different growth rates. If fishing mortality were kept at current rates, an increase in the minimum size to 3-1/4 inches would result in an increase in long-term yield per recruit of just over 1%; and a decrease in the minimum size to 3-1/8 inches would reduce long-term yield per recruit by 3.87%. It can be noted that in this area, the percentage increases in yield per recruit associated with changing the minimum size and fishing mortality would be less than in the Gulf of Maine; and the decreases would be greater.

For the offshore fishery from Georges Bank southward data is available by sex. As shown in the EIS (Table V.B.9., Figures V.B.4. and V.B.5), the rapid rates of growth and large maximum sizes attainable among offshore lobsters allow very substantial potential gains in yield per recruit, particularly among the males.

These analyses were conducted under the assumption that there is no stock-recruitment relationship. If there is, the estimated changes in yield per recruit have been underestimated. More research needs to be done to improve the understanding of the relationship between stock size and recruitment in lobsters so that the impact of future management measures may be better understood.

§ 404 Resource Conclusions

The analysis which forms the basis for the findings reported in §§402 and 403 leads to the following general conclusions:

1. Within the regions of major production in the domestic American lobster fishery (i.e., coastal areas), the great bulk of landings results from exploitation of the newly-recruiting year class. In many other similar fishery circumstances, the result has been extreme resource instability, or even recruitment failure and stock collapse. The fact that lobsters have persisted may be attributed either to fortuitous happenstance, or to continued recruitment from other sources (i.e., offshore). If all of the offshore fishery comes under exploitation at a rate similar to the inshore fishery, without benefit of measures to insure the reproductive potential of the stock in all areas, then the continued viability of the overall resource may be in significant jeopardy.

2. Because of the intensity of exploitation in coastal fisheries, relatively minor increases in minimum size might result in significant decreases in catch in the short-term. The intensity of the impacts would be less for the offshore fishery because the exploitation rate has been less.

3. By contrast, the long-term benefits from increases in minimum size may be substantial in the offshore fishery.

§ 405 Economic Considerations

Most of the economic effects of establishing a minimum size relate directly to changes in landings levels. The reader is referred to Tables V.C.1 and V.C.2 in the EIS for a state-by-state summary of these impacts. It is calculated that the average wholesale price per pound would increase in 1985 by 0.6% to 1.2% at 3-1/4 inches, while decreasing by only 0.3% at 3-3/16 inches and by 2.0% to 2.8% at 3-1/8 inches. In general, it seems that gross revenues decline and prices increase as the minimum size specification increases. At 3 3/16 inches or larger, the loss in gross revenue relative to no change (3-1/8") would be felt most in New Hampshire and New Jersey. For New Jersey, the 1985 loss in total revenue takes into account an embedded increase in "legal" landings as a result of the regulation on parts in the previous year (1984). As such, the two-year (1984-1985) revenue impact on New Jersey is a +22%, even though pounds landed are -11.5% over the same period. At 3-1/8 inches, short-term gains would be seen in all areas except New Hampshire. The most significant impact on either price or gross revenue resulting from the alternatives considered is associated with a 3-1/4 inch minimum size.

The FMP will not affect operational costs in the fishery, except possibly for minimal costs associated with trap vents and marking. The long-term resource analysis of alternative specifications of minimum size indicates that the 3-3/16 inch minimum size specification provides long-term benefits in terms of resource productivity as reflected in yield per recruit, and may provide long-term benefits in terms of reproductive potential. Further increases above 3-3/16 inches show even greater long-term benefits.

§ 406 General Implications of Other Alternatives

Although the minimum size specification is the heart of the management program, the FMP also contains a number of other supportive measures. These and others not adopted were analyzed in the plan recommended by the Northeast Marine Fisheries Board. The following discussions draw from that analysis.

Prohibition of Parts and Meats. There is no satisfactory method of relating shelled meats to lobster size. A preliminary relationship has been developed between carapace length and certain dimensions of detached lobster tails. However, prohibition on the landing or possession of mutilated lobsters (effective January 1, 1986) is necessary to make enforcement of the minimum size limitation practical. The principal argument for allowing the landing of lobster parts is that dead and injured lobsters otherwise must be discarded and wasted because the thoracic portion of a dead lobster spoils much more quickly than will detached claws and tails. However, available evidence indicates that the incidence of injured lobsters in trap catches is very low.

The problem is greatest in New Jersey. Although New York also allows the landing of lobster parts, the practice has become more prevalent in New Jersey in recent years. It can be reasonably assumed that parts landed are from lobsters smaller than the minimum size, which in New Jersey is 3-1/8 inches. Because of this practice, it can be argued that there is no effective minimum size regulation in New Jersey. The virtual prohibition on the landing and

possession of lobster parts in 1984 will result in a loss in total landings of -51.5% in that year, in spite of maintaining the current 3-1/8 inch size limit. The value of landings in New Jersey in the first year of Plan implementation (1984) will decrease about 32% (or \$2.5 million), entirely as a result of the loss of the sub-legal parts fishery. However, if a 3-1/8 inch minimum size were still maintained in New Jersey in 1985, a net increase of 9.35% in landings (+41% in revenue) relative to 1983 would be realized as a consequence of the virtual elimination of the sub-legal parts fishery in 1984. It must be emphasized, however, that relative gains in the 1985 legal landings in New Jersey (which may be expected to accrue under any contemplated uniform minimum size) will be realized only with elimination of the sub-legal parts fishery.

Because of the very high fishing mortality rates on undersized lobsters in New Jersey coastal waters, it seems likely much of the reproductive activity supporting the fishery in New Jersey, particularly in the area of the "Ambrose" fishery, is dependent on other areas. Current fishing practices drastically reduce the productivity which is potentially available from this resource component. The recruitment overfishing currently practiced in coastal New Jersey waters underscores the inherent instability of that fishery. It also may seriously impact fisheries in other areas.

The major economic impacts of the management program relate to the virtual elimination of the New Jersey parts fishery, and are as indicated above. Impacts on New Hampshire fishermen are only those associated with an increase in minimum size, and reflect a maximum one year loss of about \$448,000 at 3-3/16 inches (1985), assuming New Hampshire's compliance in State waters.

Prohibition on the Taking or Landing of Berried Females. This has no impact on the industry because it represents the continuation of a universal practice. In addition to benefiting recruitment, this may benefit yield per recruit by allowing some of the berried females to increase in size before they are harvested.

Changes in Gear Marking Requirements. Marking requirements are established for the particular purpose of enhancing the trap venting requirements of this Plan and may ameliorate some gear conflicts. The over-all issue of gear marking as that relates to gear conflicts is explored more fully in the Gear Conflicts Amendment to various fishery management plans, currently under preparation by the Mid-Atlantic and New England Fishery Management Councils.

Trap Construction Requirements. A requirement for venting trap gear would reduce lobster injury and mortality associated with trap fishing, with no loss of legal catch and a minimum of loss in incidental catch. The aim with such a regulation should be to balance the need to lessen trap-related lobster injury and mortality against the potential loss of legal-sized lobsters and incidental catch.

Available information indicates significant quantities of lobsters are wasted through entrapment in lost trap gear. Self-destruct escape portals would reduce the effective fishing life of a lost trap. However, technological information on short-lived degradable portal-linking devices and their practical application is not available at this time.

Limited Entry. Present levels of effort have been estimated to greatly exceed the amount of effort that would be required to harvest the available supply of lobsters each year. Thus, the fishery is seriously overcapitalized. The impacts of limited entry, taken alone, are primarily social and economic in nature. Limited entry may be an adjunct to a program to reduce catch, for example, to limit the negative impacts of such a reduction. However, a politically viable program of limited entry for the lobster fishery has not yet been developed.

Limitation on Catch. This would reduce fishing mortality and increase the yield from the fishery in the long-term. However, there would be serious negative socio-economic impacts if a catch limitation were instituted without some reduction in effort and participation in the fishery. Large reductions in fishing mortality would be necessary to achieve any significant increase in yield.

Limitation on the Number of Traps. This could greatly decrease the likelihood of gear conflicts in both the inshore and offshore fisheries, and might reduce fishing mortality. It has been estimated that the total number of traps in the inshore fishery could be reduced by 50% without reducing the overall catch. However, trap limitations are virtually impossible to enforce. The disparity of fishing practices throughout the range of the fishery would make it difficult to design a plan for trap limitation which would receive enough support within industry to make the limitation practicably enforceable.

Prohibition on the Possession of V-notched Lobsters. Maine is continuing its program of State notching and voluntary V-notching of berried females, along with a prohibition on the possession or landing of any lobster that has been notched. Scientific evidence is lacking on the level of conservation provided by this practice, as is evidence on the level of mortality from infection as a result of V-notching. The program is widely supported by Maine lobstermen, who have worked satisfactorily with these regulations for over forty years.

It does not appear that extending this regulation into the FCZ would have significant negative impact on lobster fishermen because Maine will continue to enforce the regulation against its fishermen anyway, and few fishermen outside of Maine report coming across notched lobsters. Any negative impact is presumably minimized by limiting the area of the applicability of the measure.

PART 5

SPECIFICATION OF THE MANAGEMENT PROGRAM

§ 501 Introduction

The sections in this Part constitute the management program under this FMP. Sections 505 through 512 are the conservation and management measures of the FMP. For Sections 502, and 505 through 512, the FMP provision is stated first, followed by a comment. These comments elaborate on the FMP provisions, explain why a particular alternative was selected, and generally indicate Council intent. However, the comments are not a part of the actual provisions and measures, and are not specifically binding.

§ 502 Optimum Yield

The Optimum Yield from the American lobster fishery is that amount of lobster harvested under the conservation and management measures specified in this FMP, including a minimum carapace length, which are designed to provide for full utilization of the resource by the United States industry while reducing the possibility of recruitment failure.

Comment. Maximum sustainable yield (MSY) is currently estimated at between 14,800 and 15,900 metric tons. Further discussion of MSY is contained in §204. This estimate of MSY and the anticipated harvest levels referred to in Parts 2 and 4 are not intended to constitute a quota or a target harvest level. Instead they are approximations of sustained annual yield against which future refinements to the FMP can be judged.

The Council's approach to Optimum Yield is adopted understanding that the management program specified in the FMP, which is basically complementary to the recommendations of the Northeast Marine Fisheries Board and already in effect in virtually all States, is designed to provide for full utilization of the resource while assuring its perpetuation through reducing the possibility of recruitment failure. The principal conservation measures in the FMP are expected to have some short-term downward effect on landings from the FCZ, principally landings in New Jersey and New Hampshire. However, the long-term viability of the resource and the minimization of economic and social dislocations are the principal considerations in defining the long-term optimal use of the lobster resource.

§ 503 Domestic Annual Harvest and Total Allowable Level of Foreign Fishing

The domestic annual harvesting capacity is estimated to be 111.6 million pounds (50,600 metric tons). Harvesting capacity is estimated by multiplying the current record high number of lobster traps in the fishery (2.224 million traps in 1978) by the historical (since 1942) record high rate of lobster catch (50.2 pounds per trap in 1951). This estimate of harvesting capacity greatly exceeds the expected 1983 catch (39.2 million pounds) principally because lobster stock sizes have apparently declined with a 70% reduction in catch rates since 1951.

Although temporarily increased harvests may result from additional fishing gear or improvements in its deployment, the steady decline in the estimated surplus production from MSY levels since about 1970 is evidence that there is currently excess harvesting capacity in the fishery. Further additions to harvesting capacity may not be expected to increase catches in the long run.

The Council determines that there is no surplus in the domestic American lobster fishery that can be made available for allocation to foreign fishing. This determination is based upon the Council's definition of Optimum Yield and its assessment of the domestic industry's capacity to harvest the American lobster resource. Historically there has been no foreign harvest of American lobsters allowed, even prior to the Magnuson Act. Given the intense exploitation rates in the inshore and offshore fisheries, it is evident that this fishery is fully exploited by American fishermen. Therefore, TALFF is set at zero.

§ 504 Domestic Annual Processing and Joint Venture Processing

An estimated 87% of the domestic catch of lobster is sold as live lobster or cooked at the time of the sale. Much of the lobster that is processed comes from weakened or dead lobster; there are no firms that earn a major share of their income by processing lobster meat. The existing network of wholesalers, primary dealers, restaurants and retailers can absorb the present domestic harvest, as well as any possible increase in lobster landings, in addition to the large amount of lobster imports.

On the basis of the above estimates of harvesting and processing capacity of the U.S. American lobster industry, it is evident that there is no opportunity for joint ventures between U.S. lobster fishermen and foreign processing operations in the foreseeable future. Therefore, JVP is set at zero.

§ 505 Minimum Size

Beginning January 1, 1985, the possession or landing of American Lobsters with a carapace length smaller than 3-3/16 inches shall be prohibited.

Comment. Adoption of this minimum size underscores the Council's basic approach to lobster management: to support the States by joining as part of a cooperative regional management effort. This is possible since most of the States have already implemented the basic management recommendations of the Northeast Marine Fisheries Board, and those recommendations are consistent with the Council's policy of promoting measures designed to improve conservation of the resource and reduce the possibility of recruitment failure. The Council expects that the minimum size will be enforced through a possession limit.

A larger minimum size may be more appropriate in the future, and indeed the Council may be a proponent of such a change. The recommendation of the Northeast Marine Fisheries Board actually was to establish the minimum size for lobsters ultimately at 3-1/2 inches. However, there are uncertainties regarding the possible effects this size could have on the catch by geographical area and on the demand for lobster. Meanwhile, the need for uniformity requires adoption of the 3-3/16 minimum size in all resource areas.

The principal impacts of this measure will be in New Jersey and New Hampshire. Further, allowing the landing of parts means that there is virtually no effective minimum size regulation currently in New Jersey. The Council recognizes that a major goal of regional management at this time should be to increase the size of lobsters being harvested in the Northern New Jersey fishery. During public review of the draft Plan, officials of that State indicated that some alternative to immediate and full implementation of the minimum size would greatly enhance their chances of implementing meaningful State regulations to bring New Jersey into conformity with the rest of the States. It can be assumed that some transitional allowance would also help alleviate impacts in New Hampshire. The Council looked into a number of possibilities, and finally concluded that the most practical and least burdensome transitional measure would be to delay the effective date of this measure to a time approximately two years from Council adoption of the Plan. In order to avoid ambiguity, this was specified as January 1, 1985.

This effective date is solely to provide for an orderly transition and to minimize the localized impacts of moving to a uniform regulation. Until the effective date, the States may continue to enforce minimum size and other regulations they deem appropriate. Although there are no guarantees when dealing with legislative processes, the Council believes that this is sufficient time to allow New Jersey and New Hampshire to implement a compatible management program.

This measure clearly puts the federal government in step with the overwhelming majority of State conservation programs, and is a signal to the other States that regulatory action is needed to conserve a valuable regional fishery. It is the Council's view that all jurisdictions should adopt and enforce this measure.

§ 506 Mutilated Lobsters

Upon Plan implementation, the landing and/or possession of lobster meat shall be prohibited. Until December 31, 1985, the landing or possession of lobster tails with a sixth abdominal segment smaller than 1-1/16 inches shall be prohibited, and only two claws per tail may be possessed or landed. After January 1, 1986, the landing or possession of lobster parts shall be prohibited.

Comment. This measure is necessary for enforcement of the minimum size measure. It is currently in force in every State except New Jersey and New York. However, as in the case of the minimum size measure, the Council believes, on the basis of public comments and further discussions with State officials, that the overall uniform regional management program would be more attainable by not trying to force New Jersey, and to a lesser extent New York, to make a substantial and immediate change. Thus, some transitional accommodation is appropriate.

In reviewing the New Jersey fishery, its current dependence on the practice of landing lobster parts is significant enough to warrant allowing a longer transitional period for moving to a fishery utilizing only whole, live lobsters. Upon consideration, the Council believes that one year beyond the time allowed for the transition to the minimum size would be appropriate. However, in the meantime, the current New York regulation regarding landing of parts, which was also recommended by the Mid-Atlantic Fishery Management Council, should be enforced.

As with the minimum size regulation, this delayed implementation is only as a transitional measure to ameliorate localized impacts in the Northern New Jersey fishery. During the transitional period, States may continue to enforce whatever statutes or regulations in this regard they believe are appropriate. However, beginning on the date of initial implementation and thereafter, the landing of lobster meat is completely prohibited.

A regulation implementing this measure should be carefully worded, recognizing that a certain amount of damage to lobsters occurs in normal fishing operations. However such wording could be based on similar State regulations. It is the Council's view that all jurisdictions should adopt and enforce this measure.

§ 507 Berried Females

The landing or possession of berried female lobsters, or female lobsters from which eggs have been forcibly removed, shall be prohibited.

Comment. Every State currently enforces this regulation, which has little impact on the industry. It contributes to recruitment as well as to yield per recruit.

§ 508 Escape Vents

Beginning January 1, 1985, all lobster traps must be constructed so as to contain one of the following: (1) a rectangular escape vent with an unobstructed opening not less than 1-3/4 inches (44.5 mm) by 6 inches (152.5 mm); or (2) two circular escape vents with an unobstructed opening not less than 2-1/4 inches (57.2 mm) in diameter; or (3) such other vent as the Regional Director may find is consistent with the above. All lobster traps and buoys must be marked with the vessel's Official Number, or, if the vessel is licensed under a State program that is approved by the Regional Director in lieu of a federal permit under §649.4(a), the State license number.

Comment. Currently three of the lobster producing States that land from offshore areas (Massachusetts, Rhode Island and Delaware) require the use of escape vents in State waters. The only negative public comment on this regulation came from areas where there is considerable valuable by-catch in lobster pots, particularly at certain times of the year. In order to allow for the development of new gear and to respond to localized problems, the measure allows the Regional Director to approve other vent configurations consistent with those specified by this measure.

There are a number of ways of providing openings in pots. Sometimes it is done by lath spacing as opposed to a constructed vent opening. Lath spacing which meets the size requirements specified in this measure is acceptable. Any alternative configuration approved by the Regional Director should be consistent with releasing a significant portion of undersized lobsters which would otherwise be retained. The Council believes that the Regional Director also should consider the specific problems of these areas in allowing alternative vent designs. Further research in this area may be necessary.

The gear marking requirement is intended to facilitate enforcement, so that appropriate officials can identify the owner of a trap upon inspection. The costs of implementing the venting and marking measures are estimated to be approximately 0 to 80¢ per trap (average 25¢ per trap).

Escape vents may be expected to significantly reduce the numbers of sub-legal sized lobsters retained in lobster traps, thereby reducing the probability of inducing lobster injuries through culling of trap catches. Lobster injury and mortality incurred through aggressive intraspecific behavior may also be expected to be reduced. Available information indicates that escape vents will not have a significant impact upon the catch of incidental species. Supporting studies are cited in the EIS (§III.C.4).

Studies of the effects of escape vents on lobster trap catches indicate an increase in overall gear efficiency. Reductions in the time required for culling may result in reduced boat time on station, thereby ameliorating the initial investment in trap modifications through savings in fuel costs. Moreover, available evidence suggests that traps fitted with escape vents may be relatively more efficient in catching legal sized lobsters. To the extent that this increased efficiency may increase fishing mortality, further studies may be warranted.

§ 509 Gear Conflicts

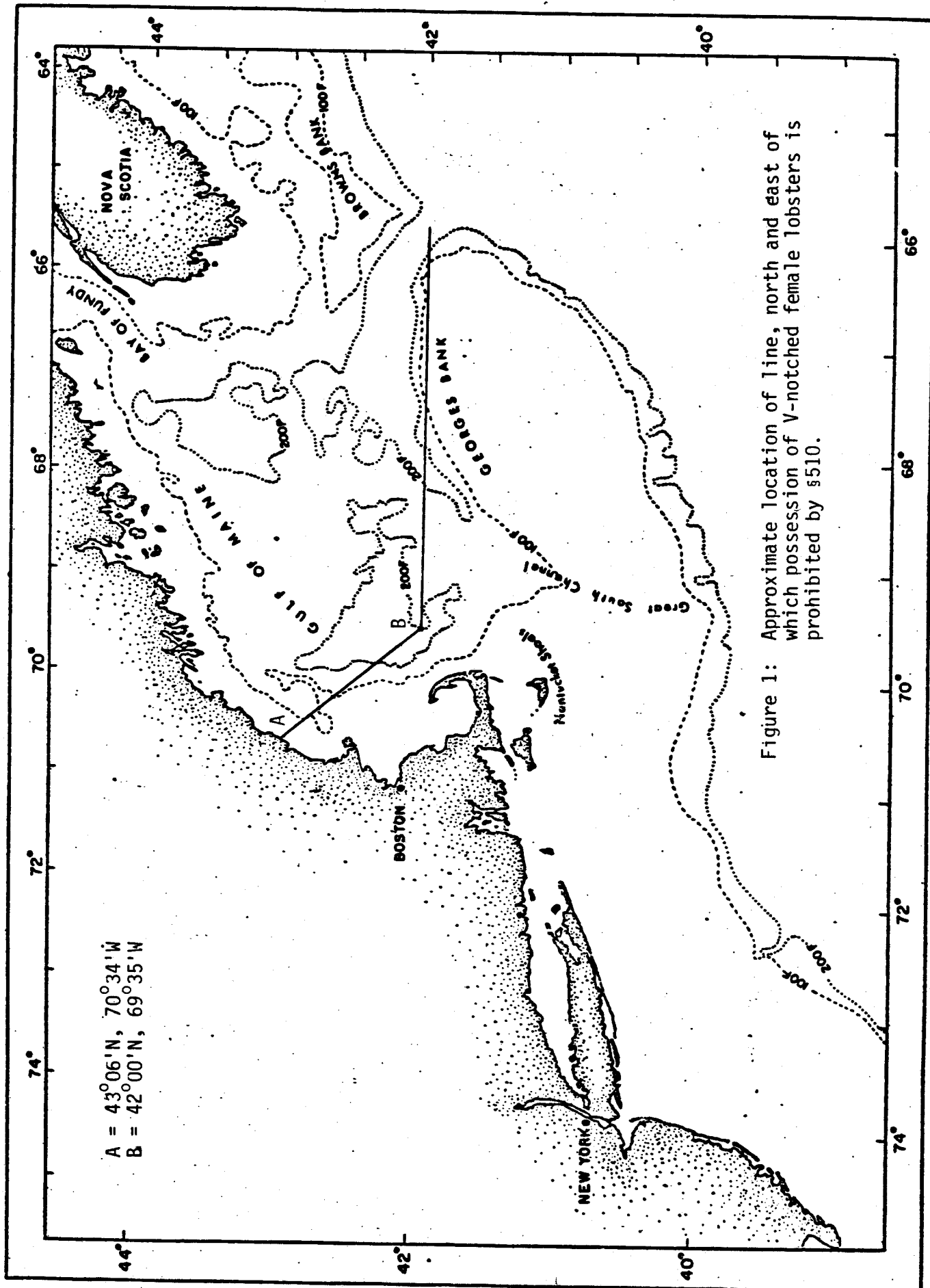
No gear conflicts measures are imposed at this time.

Comment. The Mid-Atlantic and New England Fishery Management Councils are in the process of preparing gear conflicts provisions, which will be subject to public review before adoption by the Councils. It is expected that these would not be in effect until at least 1984.

§ 510 V-Notching

The possession of V-notched lobsters shall be prohibited in the FCZ north and east of a line beginning at a point 43°06'N, 70°34'W; thence to a point 42°00'N, 69°35'W; thence due east along the 42nd parallel to the outer limit of the FCZ.

Comment. Maine has had a V-notching program for more than 40 years. The program has its foundations in State statutes, which provide that part of the receipts from lobster license sales goes to the purchase of females that become berried while being held in pounds, to compensate the pounds for lobsters which they would not under State law be able to sell. The State then



notches these lobsters, plus other females lobsters it purchases. In addition, aside from the State's efforts, many fishermen also notch berried females which they harvest in their traps. It is unlawful to possess a lobster which has been notched.

Maine lobstermen widely support the program and are convinced that it provides significant benefits to the resource. The rationale for their support is that a berried female is a proven "brood stock" lobster that will, if not harvested, continue to contribute to future spawning and ultimately recruitment to the resource. Maine fishermen strongly feel that V-notching is an appropriate complement to other management or conservation measures. They also strongly feel that, given the present minimum carapace length standard, the V-notch program provides some additional level of assurance of continued reproduction in the stock.

V-notching may provide some conservation benefit to the resource. Because those female lobsters which are notched are probably not able to be landed through at least two molts, they will have an opportunity to grow and to become berried again. Thus, the larger size of these lobsters when harvested contributes positively to yield per recruit. Further, the opportunity to become berried again presumably has some positive benefits with regard to recruitment. It has been theorized that V-notching may induce gaffkemia. Although this has been shown to happen in closed environments, it has not been shown to happen in the open ocean. Thus there is no scientific evidence that V-notching leads to significant levels of waste due to mortality from infections.

Aside from the potential conservation benefits of the V-notching measure, an important reason for including this measure in the FMP is to provide support to the management program in Maine waters. Fishery management should be responsive to the needs and desires of fishermen. The V-notching program is strongly supported by the Maine lobstermen. That support is manifested in the desire to allocate a portion of their license fees for the purpose of funding a program by the Maine Department of Marine Resources to purchase, notch and release berried lobsters from lobster pounds.

Because the program is so widely supported by such a large segment of the industry, because it has no known negative impacts on the resource and some positive impacts can be presumed, and because the impacts on lobstermen from other states are likely to be minimal or non-existent, the Council has elected to make this provision applicable to a large part of the Gulf of Maine. The line delineating the no-retention area for V-notched lobster, shown on Figure 1, is not related to any other lines and is not intended to be used for any other purposes.

§ 511 Permits and Enforcement

Any vessel which catches American lobster in the FCZ must first obtain a valid fisheries permit. Enforcement assistance requirements applicable to other fisheries should be required as appropriate.

Comment. The primary purposes of most fisheries permits under the Magnuson Act are to assist in the collection of statistics, identification of participants and communication between the government and people whose activities are regulated. The Regional Director may find it efficient to

develop cooperative permitting programs with some or all of the States, perhaps by waiving the federal permit requirement for fishermen with permits or licenses from States which he finds have acceptable programs. The Council believes this would be appropriate, although no fee is authorized for any federal permit issued by NMFS.

The permit program, as currently operated by the Regional Director, is not burdensome and is flexible enough to handle a wide range of fishery and individual circumstances. Since no fee is authorized, costs to the industry are minimal. The expense and burden could be ameliorated by a cooperative program with some or all of the States. It is expected that NMFS may require appropriate information from permit applicants such as that required in the past.

The "enforcement assistance" requirements referred to are those matters relating to safety and boarding for official inspections, as represented in §649.8 of the draft proposed regulations for this Plan.

One of the strongest sentiments expressed during the public hearings on this Plan was the need for adequate enforcement. The Council recognizes this need, and has revised its draft proposed regulations to allow for more effective dockside enforcement. The National Marine Fisheries Service should take all possible steps to continue to efficiently utilize available Federal and State enforcement resources to insure the effective implementation of the measures contained in the Plan, particularly the minimum size provision.

§ 512 Data Collection

The Regional Director shall implement and carry out a program of data collection in the lobster fishery which includes an expansion of the current weighout system, vessel logbooks and sea sampling. All or parts of this program may be implemented through voluntary or mandatory measures as the Regional Director, in consultation with the Council, finds necessary to insure the completeness, accuracy and integrity of the data. The information shall be maintained with vessel identifiers, appropriately masked to the extent practicable, so as to permit a full range of economic analyses.

Comment. Briefly summarized in a broad interpretation, the Three-Tier Data Collection Program is expected to obtain in Tier 1, information currently gathered in the Dealer Weigh-out system. Tier 2 information, currently obtained by the Interview System, will be provided through voluntary participation in a logbook program. More detailed catch and effort data will be gathered by a special voluntary program involving logbooks and sea sampling - Tier 3. The more specific details in application to the lobster fishery will be developed at a later date.

It is the Council's belief that fishery data, if it is to be useful for management purposes and justified based upon the cost of its collection, should be collected and maintained in such a manner as to preserve the internal consistencies among data from varying sources over time. Only by maintaining that consistency can accurate stock assessments be conducted and may the entire range of economic performances be analyzed in a valid manner.

The Council recommends that the data collection program should obtain, but not necessarily be limited to, the following types of information:

Information collected under Tier 1 of the Three-Tier system.

- 1) Total landings in weight by month by vessel by Subarea (5Y, 5Ze, etc.) by gear and port of landings;
- 2) Total value of landings by month by vessel by Subarea by gear and port;
- 3) Average number of trips (and days absent) by month by vessel by Subarea by gear and port; and
- 4) Monthly impoundments and releases by lobster pounds (i.e., should be included in the weigh-out system).

Information collected under Tiers 2 & 3 of the Three-Tier system.

- 1) Size-frequency samples of landed lobsters by sex (trip data);
- 2) Catch per trip (numbers and weight) by date of trip;
- 3) Daily revenues or prices associated with dated trips by size frequency, if applicable;
- 4) Number of trap hauls or net tows by dated trip;
- 5) Number of set-over-days or average duration time of net tows for the dated trip;
- 6) Total number of traps in the water on the dated trip; and
- 7) Days fished and days absent on the dated trip.

Information which may be obtained from license or permit applications.
(Data to be updated annually and with vessel identification.)

- 1) Duration of fishing season (i.e., months fished previous year); and
- 2) Vessel characteristics:
 - GRT
 - Length
 - Year built
 - Engine horsepower
 - Crew size
 - Total number of traps inventoried (if applicable).

The intent of this provision is to give NMFS the flexibility to implement the Three-Tier Data Collection Program, while providing guidance with regard to the specific types of information that should be collected. Various categories of data have been listed corresponding to the appropriate tier under that Program. Information appropriate to the second and third tiers may be best collected from vessel catch records, sea sampling or through an interview system. Information on vessel characteristics may be obtained from license or permit applications, but such information should be updated annually.

The kinds of information which have been recommended are those types of data which will be required to prepare biological stock assessments and to analyze the marketing structure within the American lobster industry. But, it must be reiterated that the value of collected data for these purposes would be seriously eroded without vessel identifiers. The types of data which have been specified are consistent with the recommendations by the Council's Scientific and Statistical Committee with regard to biological data requirements, and follow the recommendations of the Northeast Marine Fisheries Board, "... that data be collected for each area and be compatible for use in stock assessments and market analyses."

The Council particularly recognizes the States' efforts in developing data collection programs for their respective lobster fisheries (eg., the comprehensive stratified sampling program instituted in the State of Maine is currently collecting most, if not all, of the recommended types of information). The Council also notes that most of the States' efforts in this regard are essentially consistent with the Three-Tier approach. In light of these past and continuing efforts by the States, the Council recommends that NMFS develop cooperative data collection programs with the States where possible.

§ 513 Other Measures Not Included

This FMP does not include a maximum size limit such as is enforced by the State of Maine. The Council is not convinced that such a measure would serve any valid conservation and management purpose. Nonetheless, the Council does not intend that the State of Maine should be precluded from enforcing this measure against vessels licensed to fish for lobster by that State.

Limitations on entry, total catch and the number of traps have not been included in this FMP. No State implements any of these in the FCZ at this time, which would substantially undercut if not nullify any federal efforts in this regard. Each of these carries significant costs, and would require a more sophisticated understanding of the dynamics of the lobster fishery than is currently available. All of these, however, may be candidate measures for future management, and should continue to be looked at in that light.

§ 514 Continuing Fishery Management

In keeping with its management policy and management program for American lobster, the Council will continue to advocate sound management practice for the overall lobster resource. The Council will serve as a vehicle for monitoring and evaluating the efficacy of the proposed management program, and as a forum for discussions leading to a regional determination of the possible need for change in the management program. The Council will continue to implement management measures in the FCZ that it believes are in keeping with the best interests of both the resource and a majority of the principal lobster-producing states. Modifications in the management program will be accomplished through FMP amendment or regulatory change as appropriate.

In particular, the Council will continue to look into the following management issues, in cooperation with the States:

1. Increases in Minimum Size. The State-Federal Plan recommended further increases in the minimum size. Efforts are necessary to determine the economic impacts of such a measure. The Council will thus continue to be sensitive to the advisability of increasing the minimum size placing some controls on fishing mortality among immature lobsters.

2. Trawl Harvests. A number of States already regulate the use of trawls in a directed fishery for lobsters, and others are considering such a measure. Many comments at the hearings were addressed to the alleged destructive and wasteful nature of trawling for lobsters; although, competition for the resource among gear sectors is clearly an issue. The Council intends to investigate this matter further.

3. Spawning and Nursery Areas. It was suggested during the public hearings that at certain areas and times of the year the occurrence of berried female lobsters increases significantly. It will be necessary to attempt to validate this hypothesis, and then to evaluate whether spawning closures by time and/or area would be useful conservation measures.

§ 515 Research Needs

1. Lobster Marketing. The Council has begun a program to determine the effect in the marketplace of increasing the minimum size of lobsters. It recognizes that the intense exploitation of the fishery argues that the minimum size should be raised, but is sensitive to the concern that the lobster market is geared to certain sized lobsters, and that raising the minimum size could have serious economic impacts by affecting demand for the product. As noted by the Northeast Marine Fisheries Board, this research is necessary prior to any increase in the minimum size to detail the socio-economic impacts of an increase.

2. Stock-Recruitment Relationship. A stock-recruitment relationship for lobsters has not been conclusively demonstrated. Further research is necessary in this area. In particular, the Council believes that research directed to this problem which began in the State of Maine should continue to receive support in the future. This is perhaps the most critical long-term biological issue effecting lobster management. This research would permit the Council and the States to assess better the condition of the resource and the benefits that could be expected from management.

3. Inshore-Offshore Relationships. As a corollary to the previous item, it is imperative to develop a quantitative understanding of the impacts upon inshore lobster populations of recruitment from offshore areas. Such an understanding may be crucial to the complete elaboration of lobster stock/recruitment relationships. Moreover, to improve the understanding of fishery dynamics for predictive purposes, as well as to enhance the reliability of fishery performance indicators, the impacts of offshore lobsters on inshore catches (and vice-versa) may be derivable from an examination of the inshore-offshore relationships.

4. Trap Construction. Research is continuing on the development of a biodegradable link which would neutralize ghost traps. This work should be continued and supported. The Council will consider this issue further as information becomes available. Potentially, this research could result in the elimination of much wastage in the fishery from mortality due to lost gear.

5. Effects of Gauge Increases. Rhode Island only recently completed its increase to the 3-3/16 inch minimum size, and is currently studying the impacts of its action. Implementation of the regional management program may have significant impacts in New Hampshire and New Jersey. Since there is little concrete information on the impacts of gauge increases, implementation of the regional management program in these three States may present an excellent opportunity to analyze the impacts which might be expected from other possible increases in minimum size.

6. Potential Spawning Areas. As noted in §514, there were reports at the public hearings of large concentrations of berried female lobsters in certain areas at certain times of the year. The specifics of this possibility need to be investigated and evaluated to determine whether conservation benefit could be derived from the implementation of spawning closures.

7. Effects of Trawling. In response to allegations received at public hearings that trawling for lobsters may be a wasteful fishing practice, the Council believes that this question merits investigation. An initial study addressing the issue (Ganz, 1980) suggests that despite the inefficiency in using mobile trawl gear, significant rates of injury may be inflicted upon captured lobsters (particularly recently molted, soft-shell lobsters). To the extent that induced mortality and reduced value of the catch (by increasing the incidence of culls) may incur significant costs to the resource and the industry, the issue bears further study.

8. Socio-Cultural Research. The Council appreciates the need for social and cultural studies to assist in determining the associated impacts of its proposed fishery management program in affected New England and Mid-Atlantic coastal communities (see EIS V.G.).

With the exception of lobster marketing, the Council has not yet discussed the possibilities for furthering these research needs. It is hoped that their inclusion here will stimulate activity among interested parties to identify specific research topics with the view of obtaining funding from State, Federal or private sources.

PART 6

CONSISTENCY WITH OBJECTIVES AND NATIONAL STANDARDS

§ 601 Consistency with Management Objectives

As noted in Part 303, the Council adopted a management objective aimed at two principal goals: promotion of a unified regional management program for American lobster on the one hand, and improving conservation of the resource and reducing the possibility of recruitment failure on the other.

By adopting the basic management program of the Northeast Marine Fisheries Board the FMP promotes unified regional management. The principal control measure in the FMP, the minimum size specification, has already been adopted in nine of the eleven States in the Northeast. The other measures are generally adopted by the States. One exception is trap vents, but these are regulated in the States which account for the major landings from the FCZ. Another exception is the V-notching program, which is included to support the Maine management program that is so strongly supported by the fishermen in the State which lands substantially more than half of the resource. Where there are discrepancies, the Council believes that the inception of federal management will serve as an incentive for more States to adopt complementary measures.

The minimum size measure will support the efforts of the States to conserve and reduce the possibility of recruitment failure. In addition, the Council will continue to act to urge further conservation measures. Because of the jurisdictional posture of the federal government, it can do no more. Its participation in the regional management program, however, is essential.

The measures relating to mutilation, berried female, and escape vents are intended to support the efficacy of the minimum size limitation. The other measures are designed to make the management system practicably enforceable.

§ 602 Consistency with National Standards

The measures and provisions of this FMP are consistent with the National Standards contained in § 301(a) of the Magnuson Act in the following manner:

National Standard No. 1: Optimum Yield and Overfishing

Optimum yield is the central management concept of the Magnuson Act and provides an opportunity to balance the many interests which are afforded protection by the statute. The Optimum Yield determination translates the objectives of the FMP into concrete goals, giving particular attention to food production and recreational opportunities. Relevant factors can be characterized as economic, social and ecological.

However, the most significant management needs for this fishery do not relate to economic, social or ecological factors. In fact, there is little that federal management alone could do to achieve goals relating to these factors. But on the other hand, the Plan's objective recognizes the need to implement on a multi-jurisdictional basis a consistent regional program for managing lobsters. Although the program must be sensitive to the need to provide some protection to the resources where allowing full utilization by the United States industry, the principal need for this predominately inshore fishery is to achieve coordination and complementary management by the various management authorities. The Optimum Yield determination supports this thrust by adopting as optimal the amount of fish harvested under the cooperative management program.

This fishery is clearly being very intensively fished. However, it is not necessarily being overfished. The extremely high fishing mortality rates which this fishery has experienced for a number of years give rise to serious and justified concern for the resource, particularly in terms of yield per recruit. But the continuing vitality of the fishery cautions against a conclusion that the resources is being dangerously overfished from a recruitment perspective under the current exploitation regime. It might be concluded either that current management practices are sufficient to sustain the fishery, or that the traditional fishery has been fed by recruitment from other areas. If the latter is the case, and the offshore fishery continues to develop, the proposed management program will be significant in protecting the resource from ultimate overfishing.

The Council and cooperating States acknowledge a risk that the proposed measures may not be sufficient to prevent overfishing in the future. It is a risk which is reasonable to assume because the fishery has survived under intense pressure for many years, and because the economic impacts of other measures (moving to a larger minimum size, for example) are not adequately understood. The State-Federal Management Plan recommended that ultimately a minimum size of 3-1/2 inches be adopted, and the Council does not deny that this may be useful for conservation when the economic impact is better understood. The Council is moving toward a resolution of the question of the economic impacts of a higher minimum size through its marketing study, described in more detail in § 515(1), which is the priority research need for this fishery.

National Standard No. 2: Scientific Information

All of the most recent scientific information available has been used in preparing this FMP, and the FMP outlines area where more information is needed to support future management considerations. Data collection under the FMP is intended to be accomplished cooperatively with the States, as part of the National Marine Fisheries Service's overall region-wide data collection program. In this way, the cost to the industry of supplying the information and the cost to the government of gathering it is intended to be minimized. The information gathered from the data collection system is necessary to monitor the continuing efficacy of the management program and to prepare for the possibility that further management may be required.

National Standard No. 3: Management Units

The FMP promotes management of the species throughout its range. The Northeast Marine Fisheries Board's recommendations have been largely adopted by the States, and controls by the federal government in the FCZ are one of the major gaps still existing in the cooperative, unified management program.

There is no intent on the part of the Council to limit the scope of the management unit, which is broadly specified as the entire lobster resource. It must be recognized, however, that this resource is predominately harvested within State boundaries, and that the ultimate ability of the federal government to prescribe and enforce policy is limited. However, because of the wide acceptance that the cooperative regional management program has attained, the management unit in this case should not be considered so broad as to prevent attainment of the management objective.

National Standard No. 4: Allocations

The FMP makes no allocations of fishing privileges, and does not discriminate between any groups of fishermen. This is not to say that it will not impact some areas more severely than others. The lobster industry in New Hampshire and New Jersey may be impacted disproportionately, but only as a direct consequence of delays in adopting measures contained in the State-Federal Plan.

During the process of review of the draft it was suggested that the V-notch program raised issues under National Standard No. 4 since there would be a differential impact on fishermen fishing in the area affected by the program. Clearly the V-notch program does not discriminate against fishermen on the basis of their State of residence, nor does it allocate, i.e., specifically assign, fishing privileges to any group. Certainly there will be some differential impacts, since the measure will only apply to those who are covered by its specific terms. But these impacts are justified by the need for the measure -- it will have some conservation benefits, but most importantly will support a State program strongly endorsed by the fishermen in the State from within whose boundaries significantly more than half of the landings are harvested.

National Standard No. 5: Efficiency

Optimum yield in this fishery is premised upon current conditions relating to inputs such as capital, labor, interest and fuel. It is generally accepted that the fishery is overcapitalized. Finding a way to deal with this problem has eluded State and federal fishery managers alike. Given the jurisdictional posture of the federal government in this fishery, it is clear that it does not have sufficient authority to address this problem on its own. Therefore, management measures such as limited entry and gear reduction cannot be included in this management program at this time.

Nevertheless the regional management program does promote efficiency by limiting the regulatory burden on the industry, by promoting the production of whole live lobsters (the most efficient use of the resource), and by discouraging fishing practices that reduce the quality of the product.

National Standard No. 6: Variations and Contingencies

The FMP has considered variations in the marketplace, recent changes in the effort exerted in the offshore fishery and the possibility of changes in the recruitment to the fishery. The Council's conclusion in response to these is that uniform management is necessary throughout the range of the species among all jurisdictions having control over the fishery. The intent of this Plan is to carry out the federal responsibility by implementing complementary management measures.

Given the extremely high fishing mortality rates, there must be some concern that the resource could be negatively affected by the biological risks discussed under National Standard No. 1. Because of jurisdictional limitations, the most effective role the Council and NMFS could play would be as strong advocates for sound management policy on a regional basis. If the resource suddenly reacted negatively to fishing and/or environmental stress, significant action could include raising the minimum size and institution of spawning closures, presuming the scientific basis for the latter was improved. By taking the lead on the lobster marketing study and by specifying in this Plan a program for research and continuing management the Council has indicated its intent to assume a lead role in resolving future management issues.

National Standard No. 7: Costs and Benefits

Federal participation in the regional management program is necessary to insure that there is no loophole which could undermine State conservation efforts. This is an extremely valuable fishery to the region and to the Nation. The stocks are under intense exploitation which could theoretically lead to severe recruitment problems. But that exploitation takes place across a wide number of political jurisdictions with independent authority to regulate fishing. In these circumstances, there is an obvious need for cooperative management involving all of the relevant management jurisdictions, one of which is the federal government. Thus, the principal benefit of this Plan is to include the federal government in a cooperative management program with the States.

By adopting management measures which are rather uniformly implemented by the States already, the FMP minimizes costs to fishermen. Although there will be costs to the federal government, the preexistence of State management efforts will allow the National Marine Fisheries Service to implement the measures in this Plan efficiently. The federal government and the States should continue efforts to secure the participation of those States which march to the beat of a different drum.

FINAL ENVIRONMENTAL IMPACT STATEMENT

AND REGULATORY IMPACT REVIEW

FOR THE

AMERICAN LOBSTER (Homarus americanus)

FISHERY MANAGEMENT PLAN

Prepared By

New England Fishery Management Council

March 1983

COVER SHEET

RESPONSIBLE AGENCIES:

Assistant Administrator for Fisheries
National Oceanic and Atmospheric Administration
U.S. Department of Commerce
- Washington, D.C. 20235

New England Fishery Management Council
Suntaug Office Park
5 Broadway (Route 1)
Saugus, MA 01906

PROPOSED ACTIONS:

Adoption, approval, and implementation of the Fishery Management Plan for American Lobster (Homarus americanus).

FOR FURTHER INFORMATION CONTACT:

Douglas G. Marshall, Executive Director
New England Fishery Management Council
Suntaug Office Park
5 Broadway (Route 1)
Saugus, MA 01906
(617) 231-0426

TYPE OF STATEMENT:

() Draft

(X) Final

ABSTRACT:

The New England Fishery Management Council and the NOAA Assistant Administrator for Fisheries propose to adopt, approve and implement pursuant to the Magnuson Fishery Conservation and Management Act of 1976 a fishery management plan (FMP) for American Lobster. The draft FMP/EIS present the details of a lobster management program which is designed to address identified management problems. Elements of the program include the adoption of a management objective and supporting management measures that by design foster cooperative and effective management of the American lobster resource throughout the region. The management measures adopted by the Council are intended to achieve the management objective through their positive biological implications for long-term resource viability. Specifically, the management program calls for phasing in the adoption of management measures throughout the resource area that directly complement those already established by most of the coastal, lobster-producing states, including a minimum carapace length, prohibitions on the possession/landing of parts, meat or berried females, and a requirement for escape vents in trap gear. The plan also calls for the licensing of all vessels participating in the FCZ fishery. The plan encourages all states that have not already done so to adopt similar measures for their territorial sea lobster fisheries.

DATE BY WHICH COMMENTS MUST BE RECEIVED: _____

SUMMARY

The New England Fishery Management Council and the Assistant Administrator for Fisheries (NOAA) propose to adopt and implement a Fishery Management Plan for American Lobster. A Draft Environmental Impact Statement and a Regulatory Impact Review have been prepared that evaluate the proposed action relative to the criteria set forth in the National Environmental Policy Act and Executive Order 12291. A lobster management program is necessary because the resource is fished very intensively throughout its range resulting in only a small fraction of American lobsters surviving long enough to reproduce once. Such a condition in the resource increases the risk of recruitment failure and stock collapse, and jeopardizes the continuation of a viable fishery. Although catch has remained relatively constant in the American Lobster fishery, catch per unit of effort has been on a steady decline for more than twenty-five years.

The management unit of the proposed program is the American lobster resource off the Northeast coast of the United States. The measures of the FMP are considered appropriate for all components of the resource, including those under state and other national jurisdictions. These measures are based upon the recommendations of the State-Federal Cooperative Management Program, which have already been adopted by the majority of lobster-producing states. By extending established management practice to the FCZ, the FMP serves to enhance the efficacy of lobster management throughout the region. The overall management objective of the program is as follows:

To support and promote the development and implementation, on a continuing basis, of a unified, regional management program for American lobster (*Homarus americanus*), which is designed to promote conservation, to reduce the possibility of recruitment failure, and to allow full utilization of the resource by the United States industry. The management program should be sensitive to the need to minimize social, cultural and economic dislocation.

Optimum yield is generally defined as that amount of American lobster harvested under the conservation and management measures specified in the American lobster fishery management program. The specific measures of this program are listed below.

1. A minimum carapace length of 3-3/16 inches shall apply to all lobsters beginning January 1, 1985.
2. Upon Plan implementation, the landing and/or possession of lobster meat shall be prohibited. Until December 31, 1985, the landing or possession of lobster tails with a sixth abdominal segment smaller than 1-1/16 inches shall be prohibited, and only two claws per tail may be possessed or landed. After January 1, 1986, the landing or possession of lobster parts shall be prohibited.

3. A prohibition on the possession or landing of egg-bearing lobsters or lobsters from which the eggs have been forcibly removed (scrubbed) shall apply to all lobsters.
4. An escape vent shall be included in all lobster traps/pots after January 1, 1985.
5. In cooperation with a lobster management practice adhered to in State of Maine waters, the possession of V-notched lobsters is prohibited in all FCZ waters north and east of a line beginning at a point 43°06'N, 70°34'W; thence to a point 42°00'N, 69°35'W; thence due east along the 42nd parallel to the outer limit of the FCZ. This measure requires only that V-notched lobsters in the affected area be returned to the sea, thereby enhancing the effectiveness of the program in Maine waters. The measure requires no other level of participation in the V-notching program.
6. A permit shall be required to catch lobsters within the FCZ. This permit may be obtained at no fee from the Regional Director of the National Marine Fisheries Service. Any U.S. vessel is eligible for a lobster permit.

Several alternatives were examined and analyzed before the Council selected the proposed management program. These included a "no action" alternative and different specifications of a minimum legal carapace length for the FCZ. In addition, the set of management measures recommended by the Northeast Marine Fisheries Board of the State-Federal program were carefully reviewed by the Council as reflecting the best current scientific judgement for conserving the lobster resource, and in particular, for the purpose of addressing the articulated concern for recruitment overfishing. Sections III and V of this draft EIS present the alternatives considered and analyzed. In addition, Section V presents a detailed biological impact analysis of the "preferred alternative" on the lobster resource, an analysis of economic effects of the proposed program, and a discussion of the social and cultural context of the lobster fishery.

Specific conclusions of the biological and economic analyses of the management program are summarized below:

1. Within the regions of major production in the domestic American lobster fishery, the great bulk of landings result from exploitation of the newly recruiting year class. The fact that recruitment among lobster populations has persisted under such intense exploitation may possibly be explained by a biological subsidy (in the form of recruitment) from outside the traditionally exploited coastal populations. Exploitation levels among offshore (FCZ) lobster populations are, at present, probably less than half as intensive as within the inshore populations. Should all components of the lobster resource come under equally heavy exploitation without benefit of measures to insure the reproductive potential of the stock in all areas (perhaps most importantly in the FCZ), then the continued viability of the overall resource may be in significant jeopardy.

2. Because of a long history of very intensive exploitation in all coastal lobster fisheries, minor increases of the currently regulated minimum carapace lengths may have significant short-term impacts (less than one year) on catch in one or more fishery components of the overall resource complex. States having a significant participation in the offshore lobster fishery may incur substantially lower overall short-term impacts from similar management restrictions because of the history of less intensive exploitation in the offshore fishery.
3. By contrast, the potential benefits from the standpoint of average long-term resource productivity which may be achieved through regulated increases in the minimum carapace length may be substantial, particularly in the offshore fishery and in segments of the New Jersey coastal fishery.
4. Current fishing practices within the coastal New Jersey fishery relating to the landing of lobster parts, a practice which is thought to primarily involve sub-legal size classes, has been shown to drastically reduce the productivity that is potentially available from that resource component. Moreover, the heavy exploitation of sexually immature lobsters within the coastal New Jersey fishery is probably sustained only through recruitment from other sources.
5. Implementation of the proposed 3-3/16 inch minimum carapace length and regulated parts management measures is expected to have primarily local effects. The proposed carapace length is currently in effect in all lobster producing states except New Hampshire and New Jersey, and thus the majority of states will not be impacted by this measure. All lobster producing states except New Jersey currently regulate the possession or landing of butchered lobsters. The combination of measures will affect New Jersey and New Hampshire in varying degrees depending upon how these states implement them in their coastal fisheries.

If New Hampshire increases its legal minimum in the same time frame as proposed in the FMP (i.e., 1985), a maximum one-year revenue impact of -18% is possible (depending upon seasonal timing). In New Jersey, however, the implementation of a 3-3/16 inch carapace length measure in 1985 will have less of an effect than the elimination of the sub-legal parts fishery in the previous year (1984). If New Jersey were to adopt the proposed measures for its territorial sea fishery in the same time frame as indicated in the FMP, the maximum one-year revenue impact could approach -32% in 1984, followed by a +81% revenue impact in 1985, the latter resulting from the recruitment of lobsters that had not been taken as parts in the previous year. Over the two year period 1984-1985, the total revenue impact on New Jersey is estimated to be +22%. Thus, losses in the first year will be more than made up in the second year.

6. The only other measure in the FMP that may have an economic impact is the requirement for escape vents in traps. The only states involved in the lobster fishery that do not already require escape vents are New York, New Jersey, Connecticut and New Hampshire. For these states the impact of this measure is expected to be a one-time installation cost, which, depending upon the method of compliance, is likely to be insignificant.

ENVIRONMENTAL IMPACT STATEMENT/REGULATORY IMPACT REVIEW
FOR
AMERICAN LOBSTER FISHERY MANAGEMENT PLAN

Table of Contents

<u>Part</u>	<u>Page</u>
Cover Sheet.	i
*Summary.	ii
Table of Contents.	vi
* I. INTRODUCTION	1
* II. PURPOSE OF AND NEED FOR ACTION	1
* III. DESCRIPTION OF ALTERNATIVES AND PROPOSED ACTION.	3
A. Introduction.	3
B. Alternatives Including the Preferred Alternative.	3
C. Proposed Action	6
IV. AFFECTED ENVIRONMENT	11
A. The American Lobster Resource	11
(Biology & Habitat)	
B. The American Lobster Industry	34
C. The Recreational Fishery.	67
D. Other Management Institutions and Programs.	68
* V. ANALYSIS OF ALTERNATIVES AND ENVIRONMENTAL CONSEQUENCE OF PROPOSED ACTION.	74
A. Introduction	74
B. Resource Analysis of the Management Program	74
C. Economic Analysis of the Management Program	97
D. Regulatory Impacts of the Management Program	99
E. Recreational Impacts of the Management Program	106
F. Institutional Impacts of the Management Program	106
G. Social and Cultural Impacts of the Management Program	109
VI. REFERENCES	111
VII. LIST OF PREPARERS.	118
VIII. LIST OF AGENCIES, ORGANIZATIONS, AND PERSONS TO WHOM COPIES OF THE STATEMENT WERE SENT FOR REVIEW AND COMMENT	120
IX. RESPONSE TO PUBLIC COMMENTS	122
APPENDIX 1. Technical Appendix to §V.C.	

I. INTRODUCTION

The Magnuson Fishery Conservation and Management Act (MFCMA) of 1976 established a national program of fisheries management designed to achieve the optimum yield from the fishery resources of the U.S. The MFCMA authorizes eight regional fishery management councils to prepare comprehensive fishery management plans (FMP) for the resources within their geographical areas of authority. These FMPs are in turn submitted to the Secretary of Commerce for approval and implementation through the promulgation of federal regulations.

The National Environmental Policy Act (NEPA) requires all agencies of the Federal Government to include in every proposal for "major federal actions significantly affecting the quality of the human environment" a detailed statement on the environmental impacts of and alternatives to the proposed action. NOAA has determined that actions initially adopting and implementing natural resource management plans, programs or policies, including fishery management plans, are actions which normally require the preparation of an Environmental Impact Statement (Revised NOAA Directive 02-10, July 1980).

The "major federal action" described in this statement is a process, prescribed by the MFCMA, with three identifiable phases, i.e., adoption, approval, and implementation of the American Lobster (Homarus americanus) Fishery Management Plan. The first step in the process is taken by the New England Fishery Management Council (Council). The second and third steps are taken by the Assistant Administrator for Fisheries of NOAA, under authority delegated by the Secretary of Commerce.

The fishery management plan for American lobster has been under development by the Council since 1979, and a final plan is now complete. The draft FMP had been developed in consultation with the Mid-Atlantic Fishery Management Council. This Environmental Impact Statement (EIS or Statement) is intended to accompany the FMP throughout the MFCMA process and serve as a vehicle for further public and agency review of the FMP.

This Environmental Impact Statement has been prepared in conjunction with the American Lobster FMP. It has been designed to serve a multi-function role, satisfying various administrative and documentary requirements associated with the review, approval, and implementation of the American Lobster FMP. More specifically, while meeting the requirements of NEPA, this document serves as the primary reference for analyses and discussions summarized in the FMP, incorporates the elements of a Regulatory Impact Review (in accordance with the requirements and criteria of Executive Order 12291), and provides information necessary for Secretarial compliance with the Regulatory Flexibility Act (RFA). A key to the incorporated Regulatory Impact Review is found in the Table of Contents.

II. PURPOSE AND NEED FOR ACTION

Since the 1950's and particularly during the last decade, rising prices and increasing demand for lobsters have resulted in a substantial increase in levels of applied fishing effort throughout the U.S. lobster fishery. Considering the number of traps fished as a rough index of applied effort, the

coastal trap fishery has more than tripled over the last 20 years to a current level of more than 2 million traps. The offshore fishery, which was identified and began to intensify in the early 1960's, extends over much of the continental shelf and in the offshore canyons from the Virginia capes to the Northeast Peak of Georges Bank and, more recently, in parts of the Gulf of Maine. It has been estimated that the current level of exploitation on these resource components is substantially in excess of that which would provide the greatest productivity from the lobster fishery. Perhaps more importantly, the increased exploitation in the offshore fishery, coupled with the already intense inshore exploitation, has raised major concerns about the long-term viability of the overall fishery in relation to stock and recruitment. These concerns for recruitment overfishing and possible recruitment failure have been the principal factors motivating development of the American Lobster FMP.

Presently, lobster fisheries occur within the areas of authority of the New England and Mid-Atlantic Fishery Management Councils in the Fishery Conservation Zone (FCZ), as well as within the territorial waters of the coastal states from Maine to New Jersey. Important quantities of lobsters are landed at ports in each of the 10 coastal states from Maine to Virginia. Approximately 75-80 percent of the total U.S. harvest currently comes from the Territorial Sea, with the remaining 20-25 percent being taken in the FCZ.

Since 1972, the northeastern states along the Atlantic seaboard have cooperated under the auspices of the National Marine Fisheries Service's (NMFS) State-Federal Management Partnership Program to coordinate lobster conservation and management measures among the lobster producing states. In 1972 a policy group, now known as the Northeast Marine Fisheries Board (Board), was formed to provide overall policy guidance for fishery management programs developed under the State-Federal Program in the Northeast Region of NMFS. In the Fall of 1977, the Mid-Atlantic Council endorsed the preparation of a plan by the Board for management of American lobster that would encompass the entire U.S. resource. Upon completion of the plan in 1978, the Board referred the plan to the concerned states for implementation under their respective fishery management systems, and to the New England and Mid-Atlantic Councils for implementation under the MFCMA. Subsequently, the Assistant Administrator for Fisheries, NOAA, designated the New England Council to prepare the Fishery Management Plan for American lobster.

The Management Unit that the FMP specifically addresses includes the American lobster resource off the Northeast coast of the U.S. that exists from the Gulf of Maine southward to Cape Hatteras, NC, and that is thought to comprise a single stock. With respect to the components of the lobster resource that occur outside the FCZ, the Council has determined that a system of cooperative management is appropriate. Such a system of cooperative management is reflected in the fact that the provisions of the FMP are fundamentally consistent with those recommended by the Northeast Fisheries Board. In formulating the management objective of the FMP, the Council certifies the value of consistent management actions and cooperative exchanges of management information among the various entities charged with management of this important regional fishery resource. Detailed specification of the management program is found in the following section.

III. DESCRIPTION OF ALTERNATIVES AND PROPOSED ACTION

A. INTRODUCTION

To address the management problems that have been identified by the Council and described in Section II. of this document, several major policy alternatives were carefully considered by the Council before adopting the measures included in the management program for American Lobster (see Proposed Action, §III. C. below). These policy alternatives are described in §III. B. The Council proposes a lobster management program that specifies an optimum yield and establishes four specific measures for immediate implementation to achieve the optimum yield. The proposed management program also involves monitoring of the status of the region's lobster resources with a view toward modifying existing management measures or implementing additional management measures when appropriate.

B. ALTERNATIVES INCLUDING THE PREFERRED ALTERNATIVE

Before committing federal resources to the development and implementation of a fishery management program for lobster, the existing management environment was reviewed to determine whether the management problems described in Section II could be satisfactorily addressed by other management authorities or institutional arrangements. Thus, the first major alternative considered by the Council in the development of the lobster FMP was the "no action" alternative. This alternative would mean not developing and implementing a federal plan to manage the lobster fishery in the Fishery Conservation Zone (FCZ), but rather leaving the management of lobsters to state authorities through independent action and/or cooperative state agreements. The scope of current state management programs for lobster is described in Section IV. D. of this document.

The Council determined that the management problems identified could not be satisfactorily addressed through state regulation or cooperative industry practice alone, given the existing regulatory structures within the relevant states, and the potential for unregulated landings from the FCZ. With full recognition that the preponderance of lobster landings is from state waters, the Council concluded that it would reject the "no action" alternative and exercise its authority under the MFCMA to develop a management program for the lobster resource that is generally found within the FCZ adjacent to the northeastern United States.

Before the Council could identify reasonable management objectives, a fundamental lobster management policy needed to be established. Policy alternatives available to the Council included:

1. Establishing a cooperative management program for the lobster fishery, based upon the management principles that have evolved through the State-Federal process, that would be keyed to the existing management programs for lobster fisheries in state waters;
2. Establishing a management program for the lobster fishery, based again upon the management principles developed through the State-Federal process, that would assert a leadership role for the Council in formulating regional management policy and establishing management strategies.

Early in the plan development process (scoping) the Council recognized that there would be major institutional (jurisdictional) impediments to actively formulating a management program for the FCZ that would be predicated upon corresponding management action within state waters. A major factor bearing upon the Secretary's jurisdictional prerogatives for management is clearly the predominance of the fishery within state territorial waters (see §IV.A.). Nevertheless, the Council was cognizant that state efforts to develop a sound lobster management program, potentially under the aegis of the Atlantic States Marine Fisheries Commission, could easily be thwarted by an absence of supporting regulations in the FCZ. Further, the Council recognized that, given the unusually high rate of exploitation that has been maintained for many years in the coastal lobster fishery, the offshore resource may have critical biological importance, through a recruitment link, (see §IV.A.) for the long-term viability of the overall lobster fishery.

Therefore, given the jurisdictional constraints on the Council's ability to establish a unified management program for the overall lobster fishery, and with full recognition of the management efforts already underway within the states, the Council adopted a policy supporting the establishment of a cooperative management program for the overall lobster fishery (alternative 1. above). In furtherance of this management policy, the Council established the following management objective:

To support and promote the development and implementation, on a continuing basis, of a unified, regional management program for American lobster (Homarus americanus), which is designed to promote conservation, to reduce the possibility of recruitment failure, and to allow full utilization of the resource by the United States industry. The management program should be sensitive to the need to minimize social, cultural and economic dislocation.

The above management objective reflects two major concerns. These are, 1) the need to conserve and maintain a viable resource through the avoidance of recruitment overfishing and possible recruitment failure; and 2) the need to achieve effective lobster management throughout state waters and the Fishery Conservation Zone (FCZ).

The first concern implies that the abundance or condition of the spawning stock should not fall below some critical level where the risk of stock-induced recruitment failure becomes unacceptable. As with many other marine species, however, there is little quantitative basis for defining this "critical level" for American lobster. Nevertheless, with the proliferation of the lobster fishery in offshore waters in the 1970's, and the realization that the offshore component of the resource may be buffering the inshore component against intense exploitation through one of several "stock-recruitment" mechanisms, it has become clear that some means of preserving a critical level of spawning potential in the lobster resource (probably focusing on spawning stock abundance) is appropriate for maintaining recruitment, and hence a viable fishery.

There are two general approaches to achieving this goal. They are, (1) to increase the minimum size limit so that a greater number of young adult lobsters survive to reproduce, or (2) to decrease the fishing mortality rate so that more adults of all ages survive to reproduce. Various measures can be identified, relating to one or both of these approaches, that singularly or in combination are useful for maintaining or achieving an adequate spawning stock. The set of management measures recommended by the Northeast Lobster Board of the State-Federal Program, termed "conservation measures", include, in general terms, the following:

- (1) A uniform minimum carapace length.
- (2) A prohibition on the landing/possession of egg-bearing females.
- (3) A prohibition on the landing/possession of scrubbed egg-bearing females (from which eggs have been forcibly removed).
- (4) A prohibition on deliberate mutilation (i.e., dismemberment) of lobsters at sea.
- (5) A prohibition on the landing/possession of lobster parts or meat.
- (6) A requirement that all lobster traps have escape vents with dimensions appropriate to the legal minimum carapace length.

The Council has accepted these recommended measures as reflecting the current best scientific judgement on the conservation and management of the lobster resource for the purposes of addressing the "recruitment overfishing" aspect of the adopted management objective. These measures, appropriately specified for all resource areas in accordance with the current and anticipated management programs for lobster within the concerned states, are adopted as the key operative elements of the management program (see §III.C., Proposed Action).

In furtherance of its concern that there be established an effective, uniform management program throughout the region, the Council has identified two alternative management measure specifications. These specification alternatives reflect the limited disparity that currently exists among state programs (see §IV.D.). In particular, two options were available for specifying the minimum legal carapace length for lobsters:

- | | |
|----------------|--|
| 3-1/8 inches: | current regulation in New Hampshire and New Jersey |
| 3-3/16 inches: | current regulation in Maine, Massachusetts,
Rhode Island, Connecticut, New York, Delaware,
Maryland, Virginia, and North Carolina. |

Based upon the preponderance of states currently supporting a 3-3/16 inch minimum carapace length, the biological arguments generally supporting regulation at larger sizes (see §IV.A., and §V.B. for details), and the limited economic and social impacts analyzed for the larger size option (see §V.C.), the Council specified the legal minimum carapace length at 3-3/16 inches.

Finally, the Council realizes that not all states currently support a prohibition on the possession/landing of lobster parts or meat. Nevertheless, it is apparent to the Council that this measure is absolutely essential to the enforceability of the minimum carapace measure, and is therefore appropriate for inclusion in the management program.

C. PROPOSED ACTION

The proposed action is to adopt and implement a fishery management program for American Lobster (Homarus americanus) that will achieve the objective stated in §III.B. and address the lobster resource problems referenced in §II. The provisions of the management program are designed to (1) maintain the long-term viability of the resource, and (2) provide the Council and state agencies with the data and information to permit future improvements or modifications in the management program as may become appropriate. The provisions of the management program consist of the elements identified below.

Management Unit

The American lobster (Homarus americanus) resource off the Northeast coast of the United States is addressed in the FMP. The measures adopted in the FMP are considered appropriate for all components of the resource, including those under state and other national jurisdictions. The Council's interest in the overall lobster resource will be served through (1) a continuing commitment to advocate prudent conservation and management measures, and (2) a policy of supporting regionally consistent management regulations.

Optimum Yield

Optimum yield is defined as that amount of American lobster harvested under the conservation and management measures specified in the FMP, including a minimum carapace length, which are designed to provide for full utilization of the resource by the U.S. industry while reducing the possibility of recruitment failure. The principal conservation measures in the plan are expected to have some short-term effect on lobster landings. However, the long term viability of the resource and the minimization of economic and social dislocations are the principal considerations in defining the long-term optimal use of the lobster resource.

Management Measures: The following principal management measures are adopted and will be phased in order to ameliorate short-term negative impacts.

1. Minimum Size Limit

A uniform minimum carapace length of 3-3/16 inches is sought throughout the range of the American lobster. This standard shall apply to all lobsters. The Council expects that this measure will be enforced through a limit on possession.

Based upon the long-term biological implications of the two minimum carapace length options considered (see §IV.A. and §V.B.), the Council believes that the 3-3/16 inch standard is the most appropriate for current implementation. Current regulations in all lobster producing states, except New Hampshire and New Jersey, specify a 3-3/16 inch legal minimum carapace length, and will not be

impacted by this measure. If New Hampshire increases its legal minimum in the same time frame as proposed in the FMP (i.e., 1985), a maximum one-year revenue impact of -18% is possible (depending upon seasonal timing). In New Jersey, however, the implementation of a 3-3/16 inch carapace length measure in 1985 will have less of an effect than the elimination of the sub-legal parts fishery in the previous year (1984). If New Jersey were to adopt the proposed measures for its territorial sea fishery in the same time frame as indicated in the FMP, the maximum one-year revenue impact could approach -32% in 1984, followed by a +81% revenue impact in 1985, the latter resulting from the recruitment of lobsters that had not been taken as parts in the previous year. Over the two year period 1984-1985, the total revenue impact on New Jersey is estimated to be +22%. Thus, losses in the first year will be more than made up in the second year (see Section V.C for further details).

2. Lobster Butchering - Parts and Meat

A prohibition on the landing or possession of butchered/mutilated lobsters, lobster parts or lobster meat is sought throughout the range of the American lobster. The prohibition should apply to lobsters caught in all resource areas.

Current regulations in all lobster producing states except Maryland, New Jersey and New York prohibit the possession or landing of lobster parts. New York allows parts to be landed in accordance with standards that are believed to assure that they come from legal size lobsters. Therefore, the measure will not be expected to have an economic impact on the majority of the states. The impacts of this measure on the state of New Jersey are analyzed in Section V.C. in conjunction with measure #1. above. To insure the effectiveness of the measure as a resource conservation tool, other contiguous jurisdictions are urged to adopt this prohibition.

3. Egg-Bearing Lobsters

A prohibition on the possession or landing of egg-bearing lobsters or lobsters from which eggs have been forcibly removed (scrubbed) is sought throughout the range of the American lobster. The prohibition should apply to lobsters taken from all resource areas.

Current regulations in all lobster producing states prohibit the possession, landing or scrubbing of egg-bearing lobsters. This measure is intended to encourage the adoption of sound management practice throughout the resource area.

4. Escape Vents

An escape vent shall be included in all lobster traps and pots fished in the FCZ. This escape vent shall be located and dimensioned by regulation in accordance with the minimum carapace standard established in the FMP.

Currently three of the lobster producing States that land from offshore areas (Massachusetts, Rhode Island and Delaware) require the use of escape vents in State waters. For these states, the adoption of this measure will have a negligible impact. For other states that land lobsters from offshore areas (the FCZ) and do not already have a similar regulation, primarily New Jersey and New York, this measure may impose a one-time cost on fishermen. The costs of implementing this regulation are estimated to be approximately 0 to 80¢ per trap (average 25¢ per trap).

Escape vents may be expected to significantly reduce the numbers of sub-legal sized lobsters retained in lobster traps, thereby reducing the probability of inducing lobster injuries through culling of trap catches (Krouse and Thomas, 1975). Lobster injury and mortality incurred through aggressive intraspecific behavior may also be expected to be reduced (Pecci *et al*, 1978). Available information indicates that escape vents will not have a significant impact upon the catch of incidental species (Weber, 1980).

Studies of the effects of escape vents on lobster trap catches indicate an increase in overall gear efficiency (Fogarty and Borden, 1980). Reductions in the time required for culling may result in reduced boat time on station, thereby ameliorating the initial investment in trap modifications through savings in fuel costs. Moreover, available evidence suggests that traps fitted with escape vents may be relatively more efficient in catching legal sized lobsters. To the extent that this increased efficiency may increase fishing mortality, further studies may be warranted (Fogarty and Borden, 1980).

Other Measures

In addition to the principal management measures, the Council has adopted another measure for a portion of the overall resource area. The Council recognizes that the V-notching practice established in State of Maine waters may be of considerable benefit to the resource by protecting female lobsters in the population that are demonstrated spawners. This long-established management practice in Maine waters is intended to preserve the spawning potential of the local population by maintaining a "brood stock." In practice, egg-bearing females are marked with a V-notch on the telson by the fisherman before being returned to the water. It is then commonly agreed that fishermen will not retain any marked lobsters that are subsequently caught, whether they are egg-bearing or not.

Although this measure was not adopted under the State-Federal program, the scientific basis being somewhat unclear, the Council believes that the measure has merit as a conservation tool and should be supported in the general area of the affected population. Therefore, the Council has adopted the following measure:

The possession of V-notched lobsters shall be prohibited in the FCZ north and east of a line beginning at a point 43°06'N, 70°34'W; thence to a point 42°00'N, 69°35'W; thence due east along the 42nd parallel to the outer limit of the FCZ.

This measure requires only that V-notched lobsters in the affected area be returned to the sea, thereby enhancing the effectiveness of this broadly supported (fishermen) conservation practice in Maine waters. The measure requires no other level of participation in the V-notching program.

Licensing and Reporting

A permit shall be required to fish for lobsters within the FCZ. This permit may be obtained at no fee from the Regional Director of the National Marine Fisheries Service. Any U.S. vessel is eligible for a lobster permit.

Various data needs are specified in the American Lobster FMP. These data needs do not currently take the form of required submissions by permitted vessels, but rather serve as current guidance for data collection under the regionally expanded NMFS Three Tier Data Collection System. It is essential that lobster be included as part of the System, and that the System encompass the geographical limits of the lobster fishing industry.

Continuing Fishery Management

In keeping with its management policy and management program for American lobster, the Council will continue to advocate sound management practice for the overall lobster resource. The Council will serve as a vehicle for monitoring and evaluating the efficacy of the proposed management program, and as a forum for discussions leading to a regional determination of the possible need for change in the management program. The Council will continue to implement management measures that it believes are in keeping with the best interests of both the resource and a majority of the principal lobster producing states. Modifications in the management program will be accomplished through FMP amendment or regulatory change as appropriate.

Domestic Annual Harvest (DAH)

The domestic annual harvesting capacity is estimated to be 111.6 million pounds (50,600 metric tons). Harvesting capacity is estimated by multiplying the current record high number of lobster traps in the fishery (2.224 million traps in 1978) by the historical (since 1942) record high rate of lobster catch (50.2 pounds per trap in 1951). This estimate of harvesting capacity greatly exceeds the expected 1983 catch (39.2 million pounds) principally because lobster stock sizes have apparently declined with a 70% reduction in catch rates since 1951.

Although temporarily increased harvests may result from additional fishing gear or improvements in its deployment, the steady decline in the estimated surplus production from MSY levels since about 1970 is evidence that there is currently excess harvesting capacity in the fishery. Further additions to harvesting capacity may not be expected to increase catches in the long run.

Domestic Annual Processing (DAP)

An estimated 87% of the domestic catch of lobster is sold as live lobster or cooked at the time of the sale. Much of the lobster that is processed comes from weakened or dead lobster; there are no firms that earn a major share of their income by processing lobster meat. The existing network of wholesalers, primary dealers, restaurants and retailers can absorb the present domestic harvest, as well as any possible increase in lobster landings, in addition to the large amount of lobster imports.

Total Allowable Level of Foreign Fishing (TALFF)

The Council determines that there is no surplus in the domestic American lobster fishery that can be made available for allocation to foreign fishing. This determination is based upon the Council's definition of Optimum Yield and its assessment of the domestic industry's capacity to harvest the American lobster resource. Therefore, TALFF is set at zero.

Joint Venture Processing (JVP)

On the basis of the above estimates of harvesting and processing capacity of the U.S. American lobster industry, the Council determines that there is no opportunity for joint ventures between U.S. lobster fishermen and foreign processing operations in the foreseeable future. Therefore, JVP is set at zero.

IV. AFFECTED ENVIRONMENT

A. THE AMERICAN LOBSTER RESOURCE

The Species and Its Distribution

The American lobster, Homarus americanus, is a bottom-dwelling, marine crustacean that has a shrimp-like body and ten legs, two of which are enlarged to serve as crushing and gripping appendages. The American lobster is widely distributed over the continental shelf of the Western North Atlantic. It belongs to a group of decapod crustaceans called "clawed lobsters"; and its counterparts in the Eastern North Atlantic are the European lobster, H. gammarus, and the Norwegian lobster, Nephrops norvegicus. Along the inshore waters of the Western North Atlantic, the American lobster ranges from Labrador to Virginia; and along the outer continental shelf and slope within the U.S. fishery conservation zone (FCZ) it ranges from Georges Bank to North Carolina. It has been found in waters of the intertidal zone and to as deep as 700 meters (about 2,300 feet). The meat of the lobster, which is located primarily in the claws and the tail, is so highly prized that it supports one of the most intense and valuable fisheries in North America.

Principal Areas of Production

The major lobster population centers are located within the Gulf of Maine and the New Brunswick and Nova Scotia coastal waters. These areas support inshore fisheries which supply 90 percent of the total landings of American lobster. In waters of the United States, there are two important areas of population (Table IV.A.1). The most important area is along the coastal zone from Maine to New Jersey and out to a depth of 40 meters (22 fathoms). This population supports the coastal trap fishery and accounted for 83 percent of the U.S. landings in 1978. A secondary area of production is on the continental shelf and margin from Corsair Canyon to Cape Hatteras in depths to 600 meters (333 fathoms). This population supports an offshore lobster fishery that employs both traps and bottom trawls and accounted for 17 percent of the U.S. landings in 1978.

Stock Identification

The management unit addressed by this FMP probably includes numerous local groups of lobsters. Lobsters are basically territorial, and their home ranges generally do not exceed a few kilometers. Although discreet groups may exist, they are difficult to define; and the degree to which mixing occurs, as recruits or as adults, is not known. Newly-hatched lobster larvae are planktonic and, therefore, can be dispersed over wide areas. Lobsters also become more mobile after they mature, and numerous tagging experiments have shown directed movement particularly of the larger lobsters. Along the Maine coast some large, mature lobsters move in a southwesterly direction (Dow, 1974; Krouse, 1977). Egg-bearing lobsters along the Eastern shore of Cape Cod move into Cape Cod Bay during the summer months (Morrissey, 1971). Lobsters that inhabit the outer edge of the continental margin move inshore and

Table IV.A.1: The Coastal and Offshore Catch of American Lobster
By State in 1979 in Metric Tons

<u>State</u>	<u>Coastal Trap Fishery</u>		<u>Offshore Trap and Dragger Fishery</u>		<u>Total Landings</u>
	<u>Landings</u>	<u>% of Total</u>	<u>Landings</u>	<u>% of Total</u>	
Maine	10,039	100	-	-	10,039
New Hampshire	353	100	-	-	353
Massachusetts	3,258	75	1,074	25	4,332
Rhode Island	228	22	810	78	1,038
Connecticut	366	100	-	-	366
New York	149	47	170	53	319
New Jersey	204	56	161	44	365
Delaware	4	24	13	76	17
Maryland	0	0	40	100	40
Virginia	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
Total	<u>14,601</u>	<u>87</u>	<u>2,268</u>	<u>13</u>	<u>16,869</u>

Source: Figures are based on information from National Marine Fisheries Service,
Gloucester, Massachusetts.

offshore seasonally, as well as laterally, between canyon areas (Uzmann, Cooper and Pecci, 1977). For these reasons, no attempt has been made to define the management unit in terms of separate stocks, although differences in vital statistics (such as growth and mortality rates) that are known to exist between areas have been taken into account.

Important Aspects of the Life Cycle

Growth and reproduction are keyed around the molting cycle. The lobster is encased in a hard external skeleton that provides protection and body support. The skeleton is cast off periodically, which allows the body size to increase and mating to take place.

Mating occurs when the female is soft after molting. Sperm is deposited and stored until the eggs are laid, which can be up to two years. When the eggs are laid, they are fertilized and attached to the underside of the tail, where they are carried for 10 to 11 months. Females are called "berried" during the time they are carrying the eggs. Hatching occurs in the spring as water temperatures rise to about 15°C, about mid-May to mid-June.

Newly-hatched lobsters go through a free-swimming, larval stage during the first four molts, or for about 15-25 days. At this time they are planktonic and disperse according to the prevailing water movements. After the fourth molt the larvae resemble the adults and begin to seek the bottom.

Lobsters molt about 20 to 25 times between hatching and sexual maturity. Ten of these molts are during the first year, and by age five they average one per year. Lobsters reach legal, commercial size after five to seven growing seasons, depending on water temperature. After sexual maturity, females molt and carry eggs in alternate years so that the molt frequency of the female may be only half that of the male; and older females tend to be smaller than males of the same age.

Habitat and Environment

Lobsters are solitary, territorial animals. They can live in a wide variety of habitats, but usually require a crevice or burrow where they can obtain refuge. A wide variation in population density and size distribution of lobsters exists from one location to another. This has been attributed to habitat characteristics as well as effects of the fishery. The sandy bottom with overlying rock of the inshore Gulf of Maine seems to support the highest population density of lobsters (Cooper and Uzmann, 1980), although bedrock/rock, mud/rock, and mud/silt substrates also provide suitable habitat. In areas that do not provide rocky habitats, burrows are dug into mud and clay bottom to provide the necessary protection.

Temperature has the most obvious, and perhaps the most important, environmental effect on lobsters because many commonly-observed characteristics, such as growth, activity, and distribution are influenced by water temperature. Lobsters can withstand a wide range of water temperatures and thermal shocks. They can survive water cooled to the freezing point or heated to 90°F (Cobb, 1976). But growth, yield, size at sexual maturity, movement, dormancy, and many other biological attributes will vary from place to place or between seasons at one location depending on temperature change.

Salinity and oxygen levels are detrimental to lobsters only at extremely high and low levels, and these are rarely found in normal lobster habitats. Salinities above 8 parts per thousand [13.8 parts per thousand] can be tolerated by adults [larvae]. Oxygen levels of at least 1 mg. per liter can also normally be tolerated (Cobb, 1976).

- Lobsters are sensitive to certain pollutants, particularly pesticides. Heavy metals such as copper, zinc and lead are lethal at fairly low concentrations. Some types of pollutants, such as PCB's, may not have detrimental effects upon lobsters themselves but may render them unfit for human consumption.

Many studies have been done concerning the effects of crude oil on lobsters. In connection with its comments on the Draft Supplemental Environmental Statement of OCS Lease Sale 42, the National Oceanic and Atmospheric Administration, in an Appendix titled "American Lobster -- A Case Study" summarized many of these studies. Larval forms are particularly sensitive since oil occupies that portion of the water column -- the surface -- where they occur. Oil pollution also severely and negatively effects the small food organisms critical to larval lobsters.

Oil pollution also effects lobsters in their adult stages. For example, laboratory studies have indicated that small quantities of crude oil can interfere with specific, perhaps chemosensory, behavior of lobsters. Feeding behavior has been shown in these studies to be affected, with the period between first noticing food and going after it being doubled. Because of changes in feeding and other behavior, it is possible that crude oil will interfere with the ability of male lobsters to detect sex pheromones released by female lobsters, which could severely interfere with reproductive activity.

Drilling muds also can be toxic at lethal and sublethal stages. Potentially lethal components of drilling muds include petroleum hydrocarbons, asphalts, aromatic lignosulphates, heavy metals and calcium-like cations such as barium and strontium. Observed reactions of lobsters to these include, depending on the concentrations, impaired coordination, cessation of feeding, loss of mobility and death. Drilling muds also affect habitat by their tendency to settle in depressions or flow downhill, a particular problem for lobsters whose natural habitat is offshore canyon areas.

Biological Parameters

Yield Per Recruit. Yield per recruit is a means of expressing what the yield in weight per individual will be when one considers the rate of growth of the stock, the rate of mortality from fishing and from natural conditions and a minimum size (regulated or otherwise). It is basically an equation in which mortality is removing a certain number of lobsters while growth is increasing the length and weight of lobsters. The resulting points from the equation are plotted on a graph in order to determine what would happen to yield if either the legal minimum size or the fishing mortality were to change.

Yield per recruit for American lobster was examined using models by Beverton and Holt (1957) and Paulik and Gales (1964) where growth is described by the von Bertalanffy equation. Current knowledge regarding lobster growth indicates apparently distinct differences between inshore (territorial seas) populations and those found in offshore areas in the FCZ. In general, offshore lobsters appear to grow faster than those in inshore waters and reach

Table IV.A.2: Assumed Growth Parameters For
American Lobster by Resource Area

Growth Parameter	Fishery Conservation ^{1/} Zone		Gulf of Maine ^{2/} Inshore	So. New England/South ^{3/} Inshore
	Males	Females	(Sexes Combined)	(Sexes Combined)
K	.096	.074	.048	.086
t ₀	.500	.300	-.772	-.235
L _∞ (mm)	270	240	267	195
W _∞ (kg)	20.5	9.9	12.2	5.6
M	0.10	0.10	0.11	0.15
t _r	3	4	6	5
t _λ	60	60	50	20
t _c (3-1/8")	4.13	5.73	6.58	5.84
(3-3/16")	4.21	5.86	6.76	6.00
(3-1/4")	4.30	6.00	6.93	6.17

Source: ^{1/} Cooper and Uzmann (1977), Burns et al. (1979),
van Engel et al. (1979).

^{2/} Thomas (1973), Thomas (1980) pers. comm., Fair (1977)

^{3/} Briggs (1980), Halgren (1976), Russell et al. (1978),
Smith (1977), Morrissey [ed.] (1976).

larger maximum sizes. Moreover, differences in the growth characteristics may exist between separate inshore populations. For these reasons, the complete yield per recruit analysis treats a number of different lobster populations separately using available growth information (Morrissey [ed.], 1976). This section will discuss some results from those analyses and appropriate conclusions in the context of lobster management.

In an effort to develop an overall view of the resource from the perspective of its biology, growth information which has been acquired in local studies from Maine to Virginia on both inshore and offshore lobster populations has been consolidated into three broad resource areas. These resource areas are: 1) the FCZ (3-200 miles); 2) the inshore Gulf of Maine; and 3) inshore Southern New England and south. With the great bulk of the FCZ lobster populations centered in the Georges Bank/Southern New England area, lobster growth within resource area #1 (the FCZ) was assumed to be described by equations developed by Cooper and Uzmann (1977). Lobsters within resource area #2, the inshore waters of the Gulf of Maine south to Cape Cod, were assumed to exhibit growth describable by the equation developed by Thomas (1973). In resource area #3, the inshore waters south of Cape Cod, lobster growth parameters were assumed to be the average from separate studies conducted recently in Rhode Island, Connecticut, and New York. Table IV.A.2 gives the resulting set of growth parameters by resource area which provide the basis for the discussion on yield per recruit in this section, as well as certain aspects of the biological impacts analysis (§V.A).

The yield per recruit analysis considered three alternative minimum legal carapace lengths. The three alternatives which were considered are 3-1/8 inches, 3-3/16 inches, and 3-1/4 inches. A complete rationale for choosing these particular alternative sizes appears in §V.A. Briefly, a carapace length of 3-1/8 inches is the current minimum size in two of the lobster-producing states, New Hampshire and New Jersey. To the extent that the lobster management objective is concerned with establishment of a uniform management program over the entire management unit, then 3-1/8 inches represents a viable option. A carapace length of 3-3/16 inches is the current regulated size limit in most of the lobster-producing states. A larger size limit than currently exists but which is amenable to complete economic impact analysis is represented by the alternative carapace length of 3-1/4 inches. These alternative minimum sizes have been expressed in terms of the respective ages at first capture (t_c) in Table IV.A.2.

The yield per recruit curves shown in Figures IV.A.1, IV.A.2 and IV.A.3, corresponding to the three resource areas defined as above, exhibit a number of common characteristics. Yield per recruit (Y/R) for American lobster, at any given size at first capture (minimum carapace length) within the range considered, typically increases very rapidly to reach its maximum level at a fishing mortality rate (F) defined as F_{max} , and thereafter gradually declines at higher F s. F_{max} for American lobster is typically at very low levels as compared to the current estimates of F in the fishery. This implies that the total yield (weight of harvest) from the fishery could be increased with reductions of the fishing mortality rate to F_{max} . To realize such gains, however, would require very substantial reductions in F through controls on fishing effort.

An alternative method for increasing Y/R is to delay the harvest of lobsters by increasing the minimum size limit. Without addressing controls on fishing effort, it is possible to increase the potential yield from the fishery to a level which approximates the maximum yield attainable through effort controls alone, but to do so requires a substantial increase in the minimum size.

The third alternative for increasing Y/R is a combination of the first two; the maximum possible gains in Y/R would be obtained through simultaneously reducing F and increasing the minimum size limit.

The Council has endorsed a lobster management objective which seeks, in part, to reduce recruitment overfishing and the risks of recruitment failure. In deliberations which led to formulation of that management objective, the Council rejected an alternative which was based upon yield per recruit. The Council felt that to adequately meet an objective which sought to increase yield per recruit would entail substantial social and economic dislocations in the industry. In consideration of the biology of the American lobster, particularly the size at maturity, however, measures which are designed to meet the management objective which has been accepted should also have a favorable impact upon yield per recruit.

Size at Maturity. One guideline frequently used in establishing minimum size limits is the size at which some fraction of the population is sexually mature. Ideally, this fraction should be high enough to ensure replenishment of the stock under average environmental conditions. For most populations,

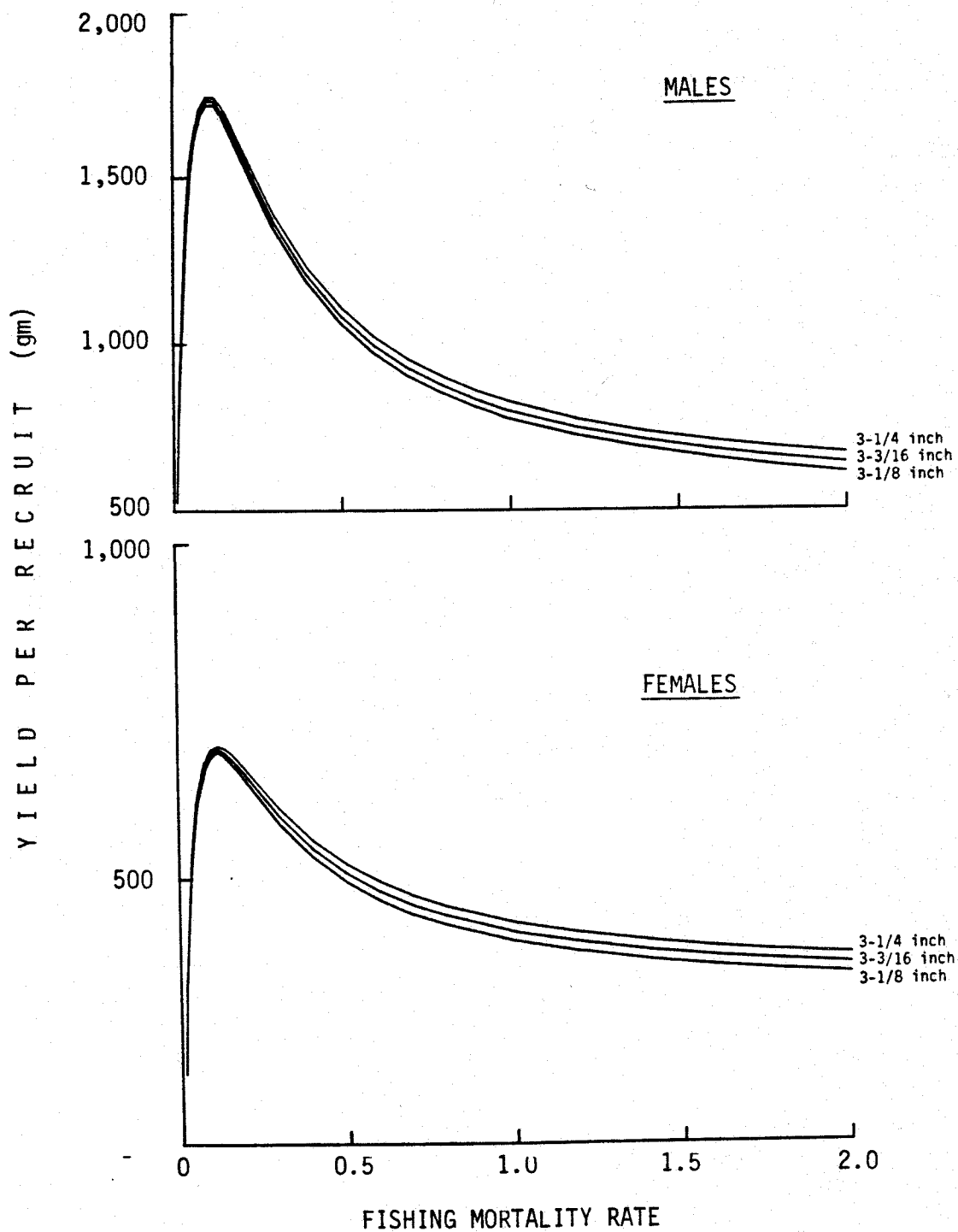


Figure IV.A.1: Yield per recruit curves for Georges Bank/south offshore American lobsters at three alternative minimum carapace lengths.

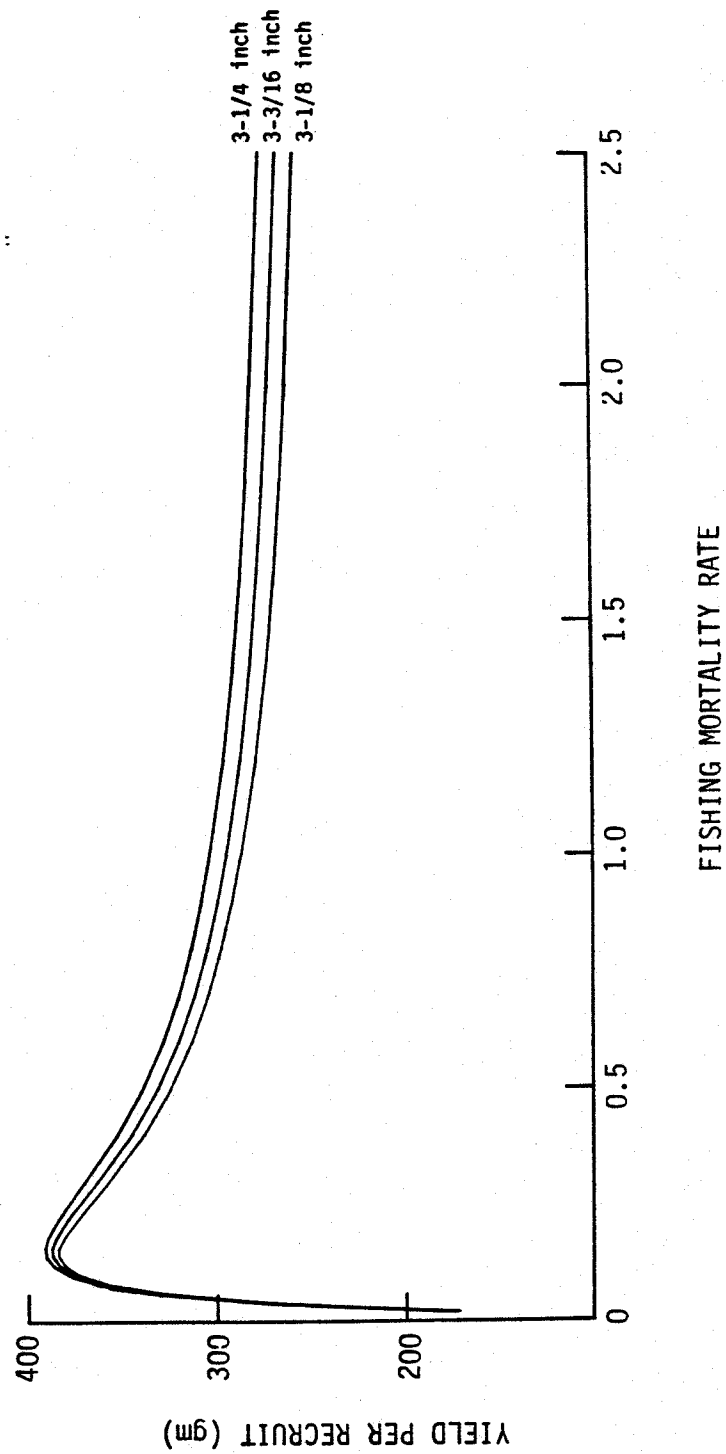


Figure IV.A.2: Yield per recruit curves for coastal Gulf of Maine American Lobsters at three alternative minimum carapace lengths.

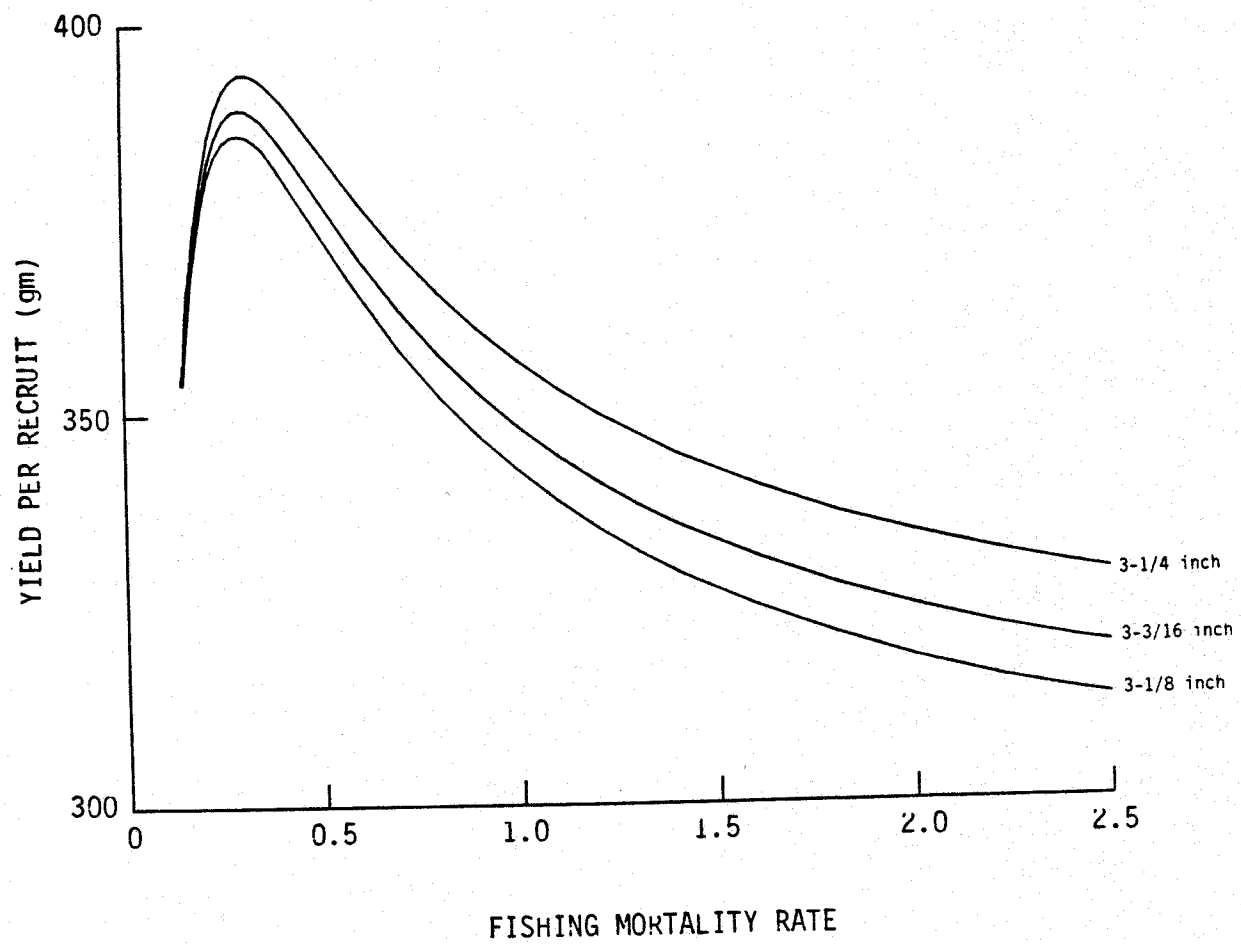


Figure IV.A.3: Yield per recruit curves for coastal Southern New England/south American lobsters at three alternative minimum carapace lengths.

however, this level cannot be determined with any precision and resource managers have therefore used somewhat arbitrary criteria. One frequently used standard is the size at which at least 50 percent of the individuals are mature. When males and females mature at significantly different sizes (as do lobsters), such criteria are usually applied to the females.

- There are several indices of sexual maturity for female American lobsters: egg diameter and color (Van Engel, 1980; Aiken and Waddy, 1980; Krouse, 1973), the relationship between carapace length and the width of the second abdominal segment (Templeman, 1944), the presence of extruded eggs, and the presence of sperm in the seminal receptacle. The most widely reported measure is the presence of external eggs, undoubtedly because this is an easily used and reliable index (Thomas, 1973).

A review of the minimum size at which female lobsters mature based on these criteria indicate that distinctive differences exist among areas. Size at maturity is highest in the Gulf of Maine and offshore waters and is lowest in the inshore Southern New England/Long Island Sound region (Table IV.A.3). In the Gulf of Maine and in offshore waters, the size at maturity is similar to or exceeds the minimum legal size. In contrast, ovigerous (egg bearing) females as small as 64 mm (2.5 inches) have been observed in Long Island Sound. Templeman (1936) suggested that differences in size at maturity could be related to temperature, with higher summer temperatures favoring earlier maturation.

The carapace length at which 50 percent of female American lobsters were ovigerous, L_{50} , was determined for five areas by the method of Wenner et al. (1974). The five areas: Maine, Long Island Sound, Narragansett Bay/Rhode Island Sound, offshore Southern New England, and offshore Virginia, were chosen to cover a wide geographical range. Using 5 millimeter increments, the proportion of egg-bearing females to total females was computed for each area, and the proportions were converted to probits. Probit regression lines were derived following the criteria of Wenner et al. (1974), and L_{50} values calculated accordingly. The analysis is complicated by the fact that not all mature females are ovigerous at any given time, particularly those in the larger size classes. Although there is evidence that multiple egg batches may be fertilized by the spermatophores of a single insemination (Aiken and Waddy, 1980), the longer intermolt period for larger females (and hence less frequent mating) apparently reduces the probability of these females bearing fertilized eggs. For this reason, Wenner et al. suggested that these larger females not be included in analyses which use the presence of external eggs as evidence of maturity. Recognizing that L_{50} values may be overestimated to the extent that mature but non-ovigerous females may have been included in the analysis, calculated values of the size at which 50 percent of the females are mature were:

	Maine	Long Island Sound	Narragansett Bay Rhode Island Sound	Offshore Virginia	Offshore Southern New England
L_{50}	102 mm 4.0 in	87 mm 3.4 in	98 mm 3.9 in	105 mm 4.1 in	100 mm 3.9 in

The estimate for Long Island Sound is probably a significant overestimate for the above reasons. Briggs (1979) indicates that the L_{50} value for Western Long Island Sound is probably about 75-77 mm (3.0 inches). Regardless, the current minimum legal size in nearly all areas is considerably less than the size at 50 percent maturity, as measured by the presence of external eggs.

Table IV.A.3: Estimates of Size (Carapace Length in Millimeters)
at Onset of Sexual Maturity for Female American Lobsters
Based on Several Criteria ^{1/}

<u>Area</u>	<u>Mature Ova</u>	<u>Extruded Eggs</u>	<u>Ratio Of 2nd AS/CL*</u>	<u>Sperm Plug/Spermatophores</u>	<u>Source</u>
Maine	77	83	80	65	Krouse (1973)
Rhode Island	-	70	-	-	Russell et al. (1978)
Conn.	-	72	-	63	Stewart (1972)
Conn.	-	67	-	-	Smith (1977)
New York	-	66	-	-	Briggs (1975)
New York	55	64	60	-	Briggs (1979b)
New Jersey	69	79	-	71	Halgren (1975)
Offshore Virginia	83	86	-	-	Van Engel et al. (1975)
Offshore Canyons	80	80	77	-	Skud and Perkins (1969)

*Second Abdominal Segment/Carapace Length
1 inch = 25.4 mm

^{1/} Sizes given indicate the smallest lobsters observed under the citation.
The average sized lobsters noted under any of the criteria were substantially larger.

Figures IV.A.4 and IV.A.5 show the cumulative percent of female lobsters mature by size, and illustrate the variation in size at maturity in different areas. The dashed vertical lines indicate carapace lengths of 3-3/16 inches and 3-1/4 inches. Note that at 3-3/16 inches, very few lobsters from offshore Virginia, Georges Bank, or Maine are mature, although about 20 percent and 4 percent of the Long Island Sound and Rhode Island female lobsters, respectively, have reached maturity. Based on these data, only about 2 percent and 4 percent of offshore New England female lobsters are mature at 3-3/16 inches and 3-1/4 inches, respectively, and 50 percent maturity is not reached until about 100 mm (3.9 inches).

It is important to recognize that there is no minimum size that can guarantee successful or improved recruitment under all conditions. Moreover, there is no information available for estimating the minimum spawning stock necessary for the prevention of recruitment overfishing. The inshore American lobster fishery has remained viable in the face of intensive fishing and despite having few lobsters reach maturity before they are subject to capture, but that viability may owe a great deal to recruitment from less intensively fished, offshore populations. The uncertainty of the role of the offshore populations makes it very important to conserve the reproductive potential of all segments of the resource.

Stock-Recruitment Relationship. The relation between the abundance of parent stock and the strength of subsequent recruitment resulting from spawning activity is, perhaps, the most crucial biological issue of lobster management in light of the management objective. Demonstration of such a relationship would allow assessment of the potential risks of recruitment failure which may be associated with alternative proposals for management of lobster stocks. Moreover, the potential benefits of management could be assessed in terms of expected additional recruitment and the subsequent enhancement of total yield from the fishery.

The stock-recruitment relationship for American lobster has received some attention in ongoing studies; the importance of a resolution of that relationship cannot be overemphasized. Fishing mortality rates in certain segments of the domestic fishery currently exceed $F = 2.0$ (86% annual rate), perhaps higher than any other U.S. fishery in the marine environment. The intense nature of the fishery, in combination with observations that the minimum legal size in many areas is at or near the size at which females first become berried, has led to significant concern among fisheries scientists regarding long-term prospects for successful recruitment.

Complicating examination of the stock-recruitment relationship among lobster populations in the wild is the fact that localized studies, no matter how intensive, may be inadequate to describe the dynamics of reproduction within those populations. Migratory activity among adults and/or dispersion of planktonic lobster larvae by water currents may require significant expansion of the area of study before an adequate understanding of events may be obtained. For example, it is possible that the level of recruitment needed to support the intensive fishery along the coast of Maine is not entirely the result of egg hatches from berried females native to the coastal population. Hence, the entire Gulf of Maine (perhaps including northeastern Georges Bank) probably should be viewed as a single lobster stock-recruitment system. Taking this perspective, much of the larval production supporting the coastal

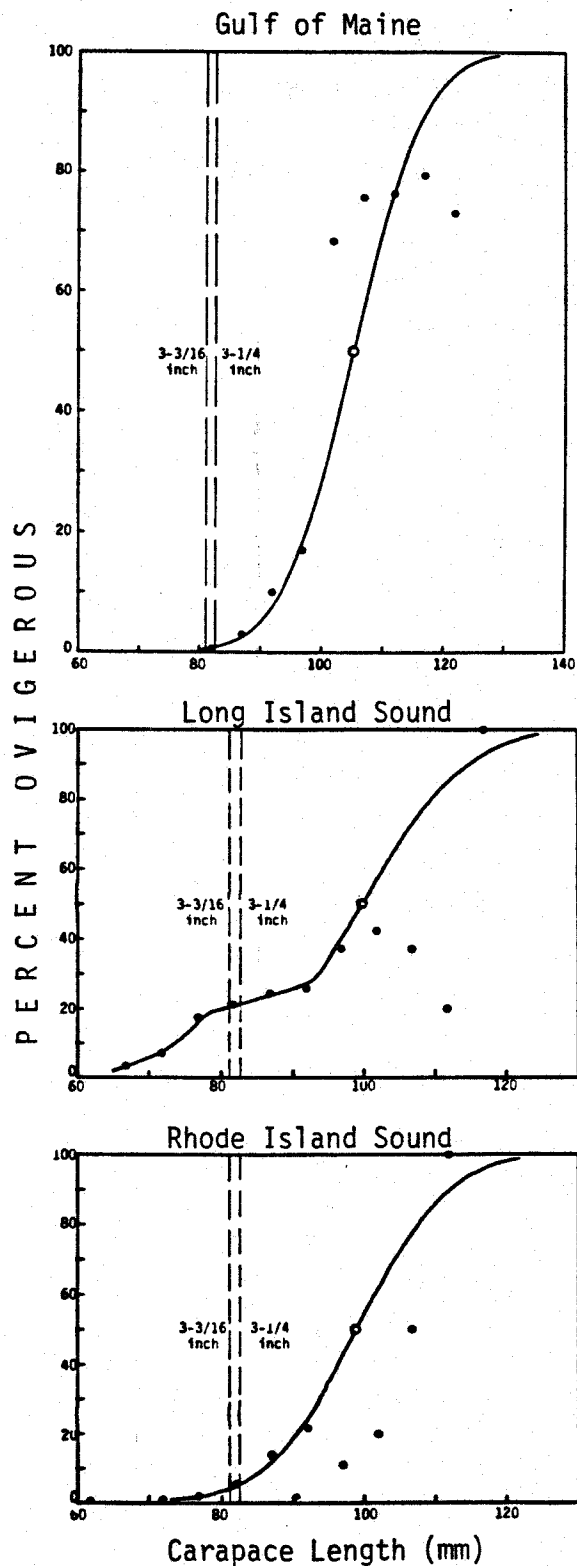


Figure IV.A.4: Maturity ogives for coastal female American lobsters. Data are cumulative percent ovigerous at carapace lengths. Vertical dashed lines indicate two alternative minimum carapace lengths.

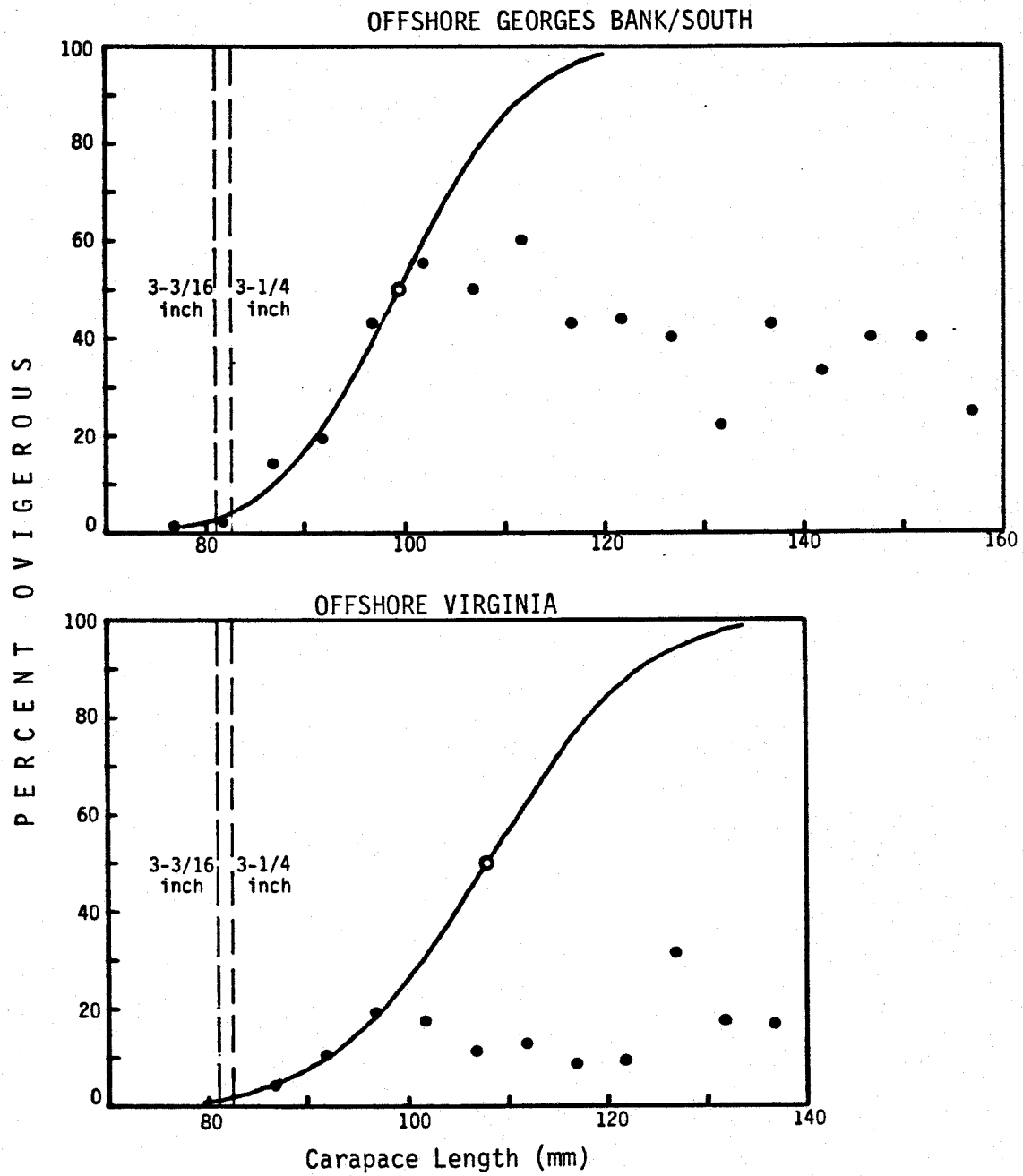


Figure IV.A.5: Maturity ogives for offshore female American lobsters. Data are cumulative percent ovigerous at carapace lengths. Vertical dashed lines indicate two alternative minimum carapace lengths.

fisheries of Southwestern Nova Scotia, Maine and south to Cape Cod may be partially dependent upon spawning activity among offshore lobster populations of Georges Bank and the central Gulf of Maine.

Another lobster stock-recruitment system which may be identified on the basis of lobster migratory activity deduced from tagging results and from recent larval survey work is the Southern New England inshore-offshore system including eastern Long Island Sound.

Two things are implied when lobster management is concerned with perpetuating strong recruitment within a stock-recruitment system:

- 1) The apparent continued, stable recruitment to the coastal fisheries, despite their historical intensity, is not a valid justification for the adoption of a laissez faire management policy. That recruitment may be partially dependent upon offshore populations.
- 2) Where an intensive coastal fishery already exists, development of a deep-water fishery within the same system should be accompanied with management measures designed to enhance the expectation of better recruitment throughout the system.

It has long been known that under controlled laboratory conditions, animal populations exhibit a close relationship between the size of the parent stock and the number of progeny which result from reproductive activity of that stock. Depending upon the characteristics of that relationship, a number of alternative mathematical formulations have been derived which are useful for predictive purposes. Using an appropriate mathematical model, chosen for its consistency with lobster biology, it may be theoretically possible to predict future recruitment. Certain attempts have been made to develop such a relationship in lobsters.

Other studies have indicated a relation between ecological conditions, principally water temperature, and the strength of lobster recruitment (see Temperature-Yield Relationships). These studies suggest, for example, that winter temperatures in the first year of life of newly-hatched lobster larvae may play a critical role. Unfortunately, a relationship between temperature and larval mortality rates has not been conclusively demonstrated. The evidence for a linkage between temperature and subsequent recruitment is based upon correlation analysis, which does not offer an explanation in terms of lobster physiology. It is possible that one or more other factors which are influenced by temperature or which vary with temperature are the true causative agents. So long as this uncertainty exists, ecological conditions of the environment should be viewed with caution as possible determinants of the level of recruitment.

It is more likely that the strength of lobster recruitment is the result of a host of factors including ecological conditions, as well as the biological elements which stock-recruitment formulations attempt to capture. Taking this view, the size of the spawning stock should not be ignored simply because its effect upon recruitment may be masked by other factors in a particular set of data. Rather, there should be a concentration of effort to improve the understanding of the relative importance of ecological and biological factors which may play a role in determining the strength of lobster recruitment. Meanwhile, prudence may imply a conservative approach to lobster management.

Estimate of Maximum Sustainable Yield. For the purposes of this analysis, the American lobster population was treated as a unit stock throughout U.S. waters from the Gulf of Maine, to North Carolina, including offshore (beyond 19 km).

Maximum sustainable yield (MSY) was estimated for the fishery using catch and effort (number of traps set annually) data for the period 1942-1978. Since a small but significant part of the total U.S. catch is not taken by traps, total effort in terms of 'trap-equivalents' was estimated by dividing total landings by the average catch per trap (Table IV.A.4 and Figure IV.A.6). Additional data on the number of trap hauls and trap soak time would provide a more precise measure of effort, but this type of information has only recently begun to be collected. The accuracy of reported landings cannot be assessed, although it is likely that the total catch has been underestimated.

An initial estimate of MSY was derived using a generalized stock production model (Fox, 1975). The MSY for the entire fishery was calculated to be 14,800 metric tons (MT) (32.6 million pounds) at an optimal applied effort level (f_{opt}) of 1.59 million traps (Figure IV.A.7 and Table IV.A.5). For comparative purposes, MSY was estimated separately for the coastal and FCZ fisheries. The MSY and f_{opt} for inshore waters were 12,300 MT (27.1 million pounds) and 1.06 million traps; for the FCZ, these values were 3,600 MT (7.9 million pounds) and 345,000 traps. The sum of the MSY estimates for the coastal and FCZ fisheries (15,900 MT) is probably not significantly different from the estimated MSY derived by the combined analysis (14,800 MT) given the degree of fit to the production model and uncertainties in the available data. The data in Table IV.A.4 indicate that the average catch and number of traps in inshore waters over the past ten years were 10,843 MT and 1.75 million, respectively. The average catch and number of trap-equivalents in the FCZ over the same period were 3,640 MT and 245,000. For the fishery as a whole, the average annual catch was 14,490 MT, taken by an average of 2.08 million traps. Note that the number of traps is about 30 percent greater than that needed to harvest the MSY. In inshore areas, this excess was 65 percent on average (93% in 1978).

These MSY estimates should be considered preliminary. The limitations of this kind of model have been well documented (Silliman, 1971; Lackey and Hubert, 1978), and the relatively crude index of effort and uncertainties as to actual landings limit the usefulness of the estimates.

Figure IV.A.7 shows that yields from the total fishery have remained relatively constant despite increasing fishing effort, but only because of landings from the offshore trap fishery since 1968. Increased catches in each sector of the fishery occurred at the end of the 1970's, perhaps due to favorable environmental conditions (Dow, 1978; see Temperature-Yield Relationships), coupled with increased fishing effort and exploitation of new areas, but all available information indicates a consistent decline in the annual catch per unit of effort (kg/trap) despite these factors. An

Table IV.A.4: U.S. Commercial Lobster Catches^{1/}, Effort, and Catch-Effort
For State Territorial Waters, the FCZ, and 0 - 200 miles from Maine to
North Carolina for 1942-1978

Year	Inshore ^{2/} (out to 3 miles)		Traps ^{3/} (10 ³)	Catch/Effort	
	Trap Catch (mt)	(thous. lb)		(kg/trap)	(lb/trap)
1942	5558	12253	278	19.99	44.08
1943	7421	16361	304	24.41	53.82
1944	8094	17844	326	24.83	54.74
1945	10274	22650	478	21.49	47.39
1946 ^{6/}	10984	24216	587	18.71	41.25
1947	10801	23812	674	16.03	35.22
1948	9390	20701	617	15.22	33.55
1949	11128	24533	612	18.18	40.09
1950	10394	22915	579	17.95	39.58
1951	11680	25750	513	22.77	50.19
1952	11194	24679	545	20.54	45.28
1953	12477	27507	569	21.93	48.34
1954	12080	26632	628	19.24	42.41
1955	12649	27886	675	18.74	41.31
1956	11515	25386	667	17.26	38.06
1957	13316	29357	689	19.33	42.61
1958	11857	26140	754	15.73	34.67
1959	12589	27754	857	14.69	32.39
1960	13310	29344	844	15.77	34.77
1961	11622	25622	895	12.99	31.67
1962	12122	26724	909	13.34	29.40
1963	12342	27209	867	14.24	31.38
1964	12169	26828	904	13.46	29.68
1965	11195	24681	949	11.80	26.01
1966	11572	25512	947	12.22	26.94
1967	10026	22104	908	11.04	24.34
1968	12210	26918	966	12.64	27.87
1969	12164	26817	1062	11.45	25.25
1970	11583	25536	1455	7.96	17.55
1971	10272	22646	1421	7.23	15.94
1972	10443	23023	1642	6.36	14.02
1973	10168	22417	2062	4.93	10.87
1974	9375	20668	1902	4.93	10.87
1975	10244	22584	1989	5.15	11.35
1976	10378	22880	1894	5.48	12.08
1977	11421	25179	2043	5.59	12.32
1978	12379	27291	2043	6.06	13.36

Table IV.A.4 (continued): FCZ (3 to 200 miles)

Year	Trap Catch		Traps ^{4/} (10 ³)	Catch/Effort Indices		Total ^{5/} Catch		Total Effort (10 ³ Traps)
	(mt)	(thous. lb)		(kg/trap)	(lb/trap)	(mt)	(thous. lb)	
1942	-	-	-	-	-	19	42	-
1943	-	-	-	-	-	29	64	-
1944	-	-	-	-	-	36	79	-
1945	-	-	-	-	-	33	73	-
1946 ^{6/}	-	-	-	-	-	28	62	-
1947	-	-	-	-	-	49	108	-
1948	-	-	-	-	-	125	276	-
1949	-	-	-	-	-	55	121	-
1950	-	-	-	-	-	127	280	-
1951	-	-	-	-	-	87	192	-
1952	-	-	-	-	-	157	346	-
1953	-	-	-	-	-	272	600	-
1954	-	-	-	-	-	385	849	-
1955	-	-	-	-	-	480	1058	-
1956	-	-	-	-	-	503	1109	-
1957	-	-	-	-	-	349	769	-
1958	-	-	-	-	-	469	1034	-
1959	-	-	-	-	-	565	1246	-
1960	-	-	-	-	-	801	1766	-
1961	-	-	-	-	-	1054	2324	-
1962	-	-	-	-	-	1235	2723	-
1963	-	-	-	-	-	1365	3009	-
1964	-	-	-	-	-	1854	4087	-
1965	-	-	-	-	-	2480	5467	-
1966	-	-	-	-	-	1775	3913	-
1967	-	-	-	-	-	2048	4515	-
1968	-	-	-	-	-	2491	5492	-
1969	52	115	-	-	-	3139	6920	-
1970	666	1468	9	-	-	3863	8516	-
1971	2530	5578	171	14.80	32.62	5007	11039	338
1972	3088	6808	74	41.73	92.00	4183	9222	100
1973	2312	5097	123	18.80	41.44	2984	6579	159
1974	2617	5769	232	11.28	24.87	3570	7871	316
1975	2672	5891	209	12.78	28.19	3454	7615	270
1976	3444	7593	309	11.15	24.57	3915	8631	351
1977	2480	5467	173	14.34	31.60	3013	6643	210
1978	2789	6149	181	15.19	33.97	3274	7218	216

Table IV.A.4 (continued): Inshore and FCZ (0 - 200 miles)

Year	Trap Catch (mt) (thous. lb)		Traps (10 ³)	Catch/Effort Indices (kg/trap) (lb/trap)		Total Catch (mt) (thous. lbs)		Total Effort (10 ³ Traps)
1942	5558	12253	278	19.99	44.08	5577	12295	279
1943	7421	16361	304	24.41	53.82	7450	16424	305
1944	8094	17844	326	24.83	54.74	8130	17924	327
1945	10274	22650	478	21.49	47.39	10307	22723	480
1946	10984	24216	587	18.71	41.25	11012	24277	589
1947	10801	23812	674	16.03	35.33	10850	23920	677
1948	9390	20701	617	15.22	33.55	9519	20986	625
1949	11128	24533	612	18.18	40.09	11183	24654	615
1950	10394	22915	579	17.95	39.58	10521	23195	586
1951	11680	25750	513	22.77	50.19	11767	25942	517
1952	11194	24679	545	20.54	45.28	11351	25025	553
1953	12477	27507	569	21.93	48.34	12749	28107	581
1954	12080	26632	628	19.24	42.41	12465	27481	648
1955	12649	27886	675	18.74	41.31	13132	28951	701
1956	11515	25386	667	17.26	38.06	12028	26517	697
1957	13316	29357	689	19.33	42.61	13679	30157	708
1958	11857	26140	754	15.73	34.67	12349	27225	785
1959	12589	27754	857	14.69	32.39	13193	29086	898
1960	13310	29344	844	15.77	34.77	14136	31165	896
1961	11622	25622	895	12.99	28.63	12700	27999	978
1962	12122	26724	909	13.34	29.40	13378	29493	1003
1963	12342	27209	867	14.24	31.38	13731	30272	964
1964	12169	26828	904	13.46	29.68	14043	30960	1043
1965	11195	24681	949	11.80	26.01	13719	30245	1163
1966	11572	25512	947	12.22	26.94	13399	29540	1096
1967	10026	22104	908	11.04	24.34	12131	26744	1099
1968	12210	26918	966	12.64	27.87	14769	32560	1168
1969	12216	26932	1062	11.50	25.36	15327	33790	1333
1970	12249	27004	1464	8.37	18.45	15489	34147	1851
1971	12769	28151	1592	8.02	17.68	15279	33684	1905
1972	13513	29791	1716	7.87	17.36	14626	32245	1858
1973	12464	27478	2185	5.70	12.58	13152	28995	2307
1974	11987	26427	2134	5.62	12.38	12945	28539	2303
1975	12897	28433	2198	5.87	12.94	13698	30199	2334
1976	13666	30128	2203	6.20	13.68	14293	31511	2305
1977	13901	30646	2216	6.27	13.83	14434	31822	2302
1978	15128	33352	2224	6.80	15.00	15653	34509	2302

- 1 Source of landings data: Fisheries of the United States (1971-78); Fishery Statistics of the United States, Statistical Digests (1942-1975).
- 2 For the inshore area trap catch and number of traps equals the total catch and effort.
- 3 Numbers of inshore traps (0-3 miles) were estimated for 1971-78 by dividing the catch-effort (0-12 miles) into the respective inshore catches. These estimates were then subtracted from the total traps (0-12 miles) to give an estimate of traps (3-12 miles) which were added to the offshore traps to estimate the number of traps in the FCZ.
- 4 1972 offshore traps include an estimate for NY and NJ which is not given in the Statistical Digest.
- 5 FCZ total catches 1971-75 were obtained by adding 3-12 mile catches from Fisheries of the United States to offshore trap and otter trawl catches; 1976-78 catches were taken from the Fisheries of the United States.
- 6 Landings data for NH, NJ, and DE and trap effort for NH, MA, and RI were unavailable in 1946. The Digest used 1945 values to estimate the missing data values.

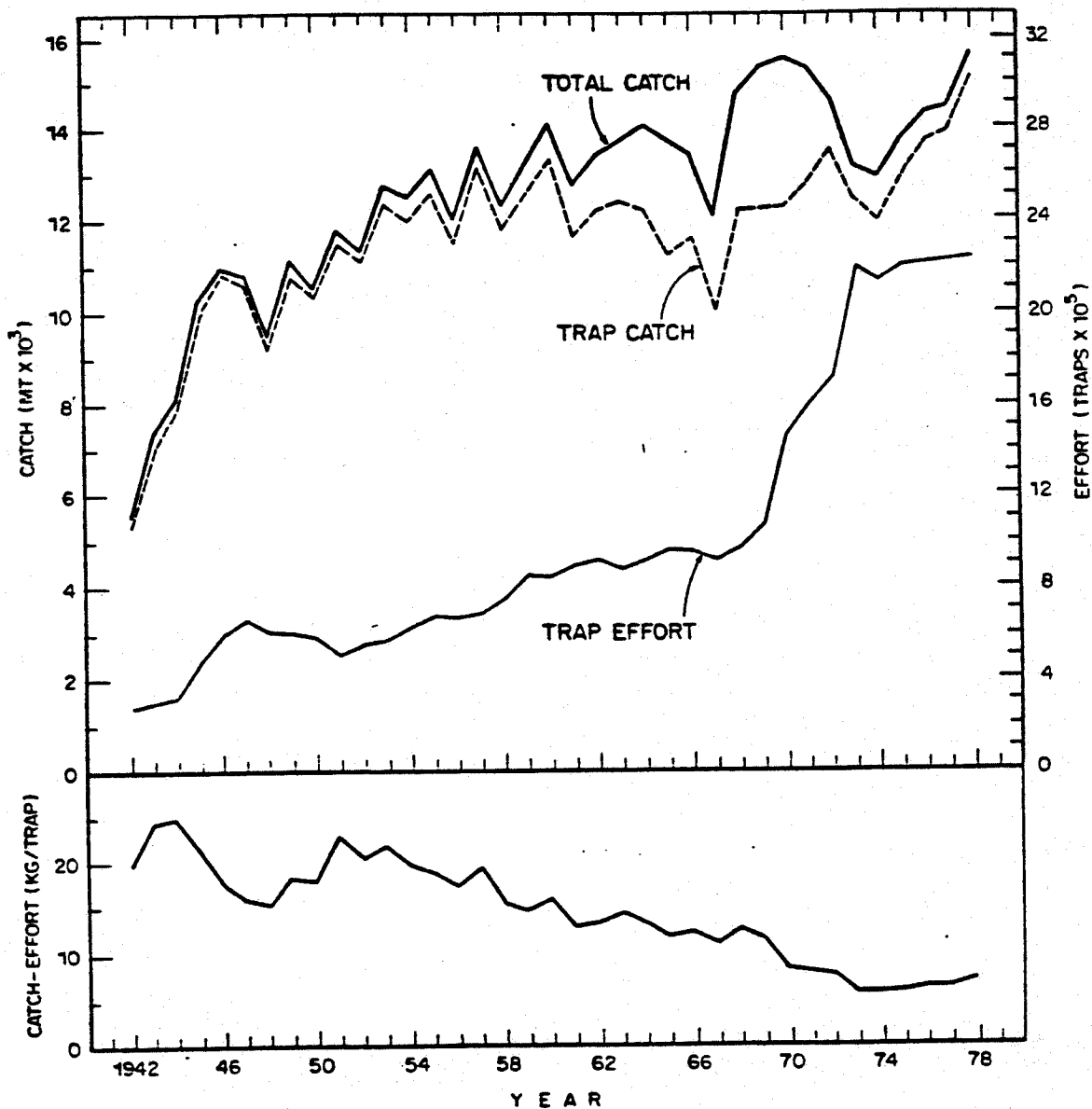


Figure IV.A.6: Annual catch data from the total U.S. fishery for American lobster.

Table IV.A.5: Estimates of Maximum Sustainable Yield and Corresponding Optimal Applied Fishing Effort for American Lobster Using the Generalized Production Model of Fox (1975)

Area	MSY metric tons [thousand pounds]	f_{opt} (traps)	Degree of Fit Index (r^2)
Coastal (0-3 mi)	12,300 [27,100]	1.06×10^6	0.948
FCZ (3-200 mi)	3,600 [7,900]	3.45×10^5	0.879
Total	14,800 [32,600]	1.59×10^6	0.960

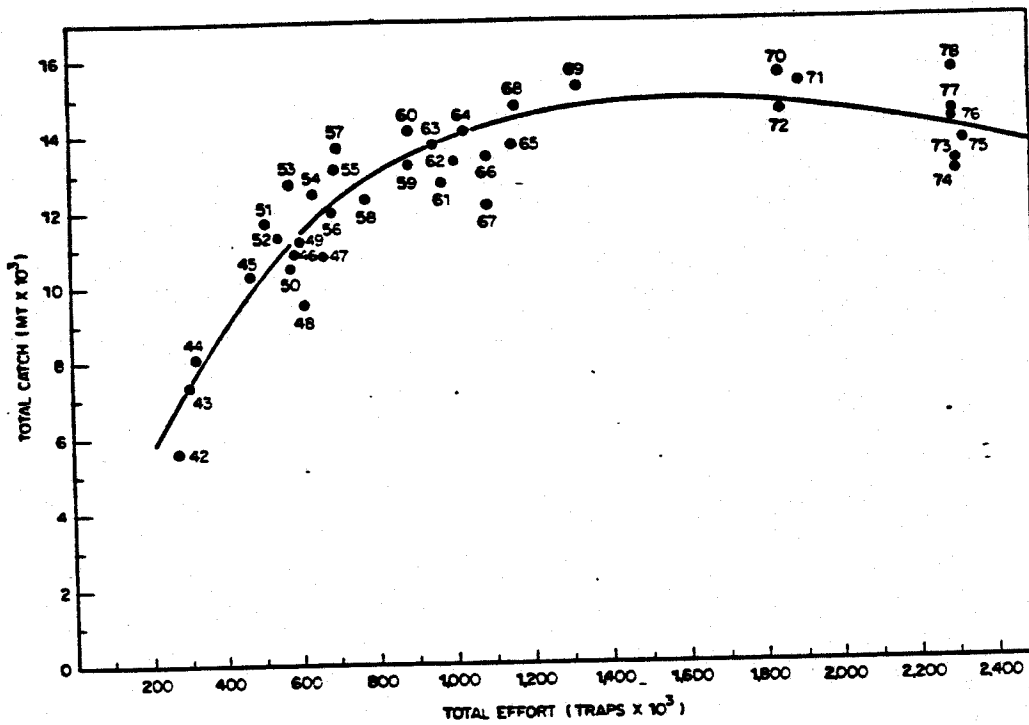


Figure IV.A.7: Total production from the U.S. fishery for American lobster based upon the generalized stock production model (Fox, 1975).

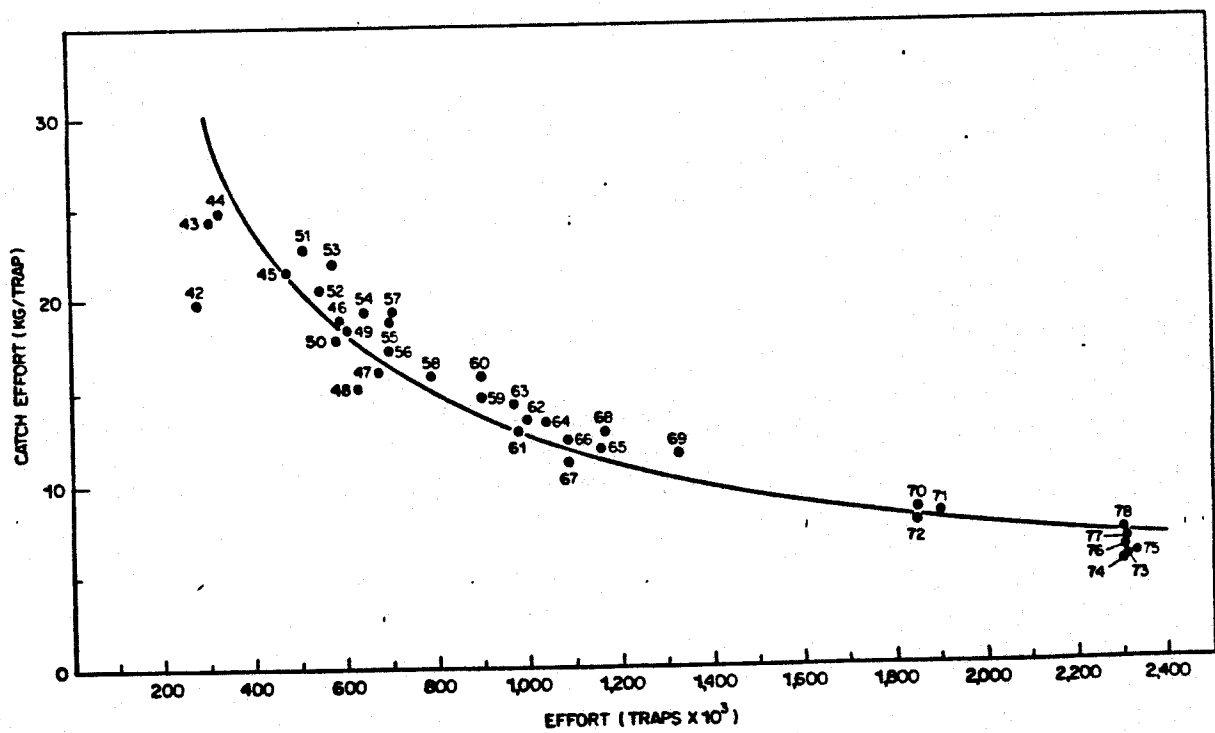


Figure IV.A.8: Representation of annual catches per unit of effort in the total U.S. fishery for American lobster.

exponential decline in catch/effort as a result of the increase in the number of traps set is evident (Figure IV.A.8).

If fishing effort is increased beyond current levels it is not expected to result in increased long-term average lobster production. Over the past 30 years, total effort in the fishery has increased nearly 400% (in terms of trap-equivalents), while total landings have increased just 40%. The current, historically high harvests, have probably resulted from temporarily favorable environmental conditions combined with record effort levels. Continually escalating effort has, however, increased the risk of recruitment overfishing.

Temperature-Yield Relationships. Sea temperature has been shown to influence lobster growth, survival, and recruitment; the activity and catchability of lobsters; and lobster movements or migrations. Dow (1961, 1966, 1969, 1976) has demonstrated that increases and declines in the annual catch and the timing and magnitude of the seasonal catch of American lobster are correlated with cyclic and seasonal fluctuations in temperature as well as fishing effort. On the basis of historical data on sea water temperature, effort, and catch, Dow (1976) states that optimum or near optimum mean annual sea temperatures for lobster range from approximately 9-11°C, as determined from historical surface temperature measurements at Boothbay Harbor, Maine. Uzman et al. (1977) concluded from seasonal distribution of tag recoveries according to depth that migratory behavior of lobsters off Southern New England is motivated by temperature and that the offshore population of the region maintains itself within a temperature regime of 8-14°C. McLeese and Wilder (1958) found that lobsters acclimated to 10-15°C showed the greatest range of temperatures for activity and that the catchability of lobsters is almost directly proportional to their activity.

Dow (1966) reviewed cyclic and geographic trends in sea temperatures and lobster landings and concluded that sea temperature fluctuations influence annual landings of American lobster about 5% per degree (F) of annual temperature change. Writing of the interaction of fishing effort and temperature on the catch in Maine in the period 1958-1973, Dow (1976) stated that when fishing effort was approximately the same, the Maine catch decreased 2,000 metric tons in association with each degree (C) decline in sea temperature. He concluded that sea temperature declines over the period have influenced both the abundance and catchability of legal lobsters in Maine, while high fishing mortality associated with recent increases in effort have decreased the yield from the fishery and accelerated the decline in lobster abundance in the northern areas (Dow, 1969, 1976).

Flowers and Saila (1972) developed yield prediction equations for the northern lobster producing areas using only lagged and present temperatures as the independent variables. A test of the validity of holding effort constant under the assumption that the fishery has been saturated with fishing effort since the end of World War II demonstrated that catch variation due to temperature was dominant over variation due to effort. Present temperature was found to be significant as an indicator of current yield, but it was second in importance to the lagged combination of T₋₆, T₋₇ and T₋₈, with T₋₆ (the temperature six years earlier than the yield estimate) the most significant contributor.

Present temperature would be expected to affect the lobster catch on the basis of the findings of McLeese and Wilder (1958) that temperature influences lobster activity and catchability, and of Dow (1966, 1976) that temperature influences lobster molting and recruitment to the fishery. The significance of lagged temperature as an indicator of yield (Flowers and Saila, 1972) suggests that temperature influences larval production and/or survival. Scarratt (1964) found no evidence of a relationship of temperature and larval abundance in Northumberland Strait. Flowers and Saila (1972) analyzed winter and summer temperatures and found that winter temperatures were more significant for the development of yield prediction equations. The authors speculated that the significance of winter temperatures may indicate high first year mortality during the colder winter months, with subsequent effect on the northern inshore yield six, seven, and eight years later.

In addition to influencing the annual catch, temperature may influence the timing and magnitude of the seasonal catch. Relatively high winter-spring temperatures induce an early molt; and with current high levels of fishing effort, the catch is concentrated during the first quarter of the July to June lobster year (Table IV.A.6). The higher the winter-spring temperature, the earlier the molt, the greater the concentration of the catch in the first quarter, and the greater the reduction in the supply available to the fishery in the second quarter. Conversely, when winter-spring temperatures are relatively low and the first quarter catch is reduced, a greater supply of late molt lobsters is available to the fishery during the second quarter months of October-December. The catch in the second quarter, however, is affected also by the influence of summer and fall temperatures on lobster activity. In addition, the spring fishery in areas where there is no important winter fishery may be inflated in some years by low temperatures in the preceding calendar year (Dow, 1976).

Information on the relationship of temperature and yield of American lobster is limited to the inshore fishery, primarily in Maine. Writing prior to the development of the major offshore fisheries, Dow (1969) implied from cyclic and geographic trends of temperature and catch that the factors affecting lobster abundance in Maine prevail also in the Southern New England/Mid-Atlantic area. With the exception of Uzmann et al. (1977), nothing has been written on the effects of temperature on the lobster fisheries in the southern areas. While the basic premise of Dow (1969) that temperature and fishing effort are largely responsible for fluctuations of the lobster fishery may be valid, the relationship of temperature and yield may not be precisely the same for the northern and southern areas. Possible modifying factors include the existence of lobster migrations and inshore-offshore fisheries in the southern areas.

B. THE AMERICAN LOBSTER INDUSTRY

History of Exploitation and Development

Lobster was marketed in Boston at least as early as 1740. By 1810, commercial lobster fishing had begun at several locations in Massachusetts and Connecticut. The fishery began expanding rapidly about 1840, and by 1880 extended from the Maritime Provinces in Canada to as far south as Delaware. Total U.S. landings in 1880 were 9,208 metric tons (20.3 million pounds) of

Table IV.A.6: Percentage of Calendar Year Lobster Catch in Maine
By Selected Months.

Year	July	Aug	Sept	Oct	Nov	Total %	Annual Mean Temp. °C	Total Annual Catch 10 ³ mt
1945	10	14	(15)	15	11	65	8.4	8.7
1946	9	13	15	(16)	11	64	8.5	8.5
1947	9	18	(19)	17	12	75	9.2	8.3
1948	8	15	(18)	15	12	68	8.2	7.2
1949	10	18	(19)	16	9	72	10.1	8.7
1950	10	20	(20)	14	9	73	9.6	8.3
1951	14	(21)	16	13	8	72	10.8	9.4
1952	12	(24)	19	12	8	75	10.1	9.1
1953	15	(21)	18	12	9	75	11.1	10.1
1954	13	(24)	19	13	9	78	10.2	9.8
1955	13	(24)	21	13	8	79	10.0	10.3
1956	6	18	(22)	20	11	77	9.2	9.3
1957	12	(20)	18	16	10	76	9.4	11.1
1958	10	18	(20)	15	10	73	8.5	9.7
1959	9	15	(21)	17	11	73	8.3	10.1
1960	10	17	(21)	17	10	75	8.9	10.9
1961	8	15	18	(19)	12	72	8.5	9.5
1962	9	17	(21)	19	11	78	8.1	10.0
1963	9	15	18	(19)	11	72	8.8	10.3
1964	10	13	16	(18)	11	68	8.3	9.7
1965	9	13	18	(18)	10	68	7.7	8.6
1966	8	12	19	(19)	9	67	7.6	9.0
1967	8	11	15	(18)	12	64	7.3	7.5
1968	8	13	(21)	20	11	73	8.1	9.3
1969	9	15	(21)	19	10	74	8.9	9.0
1970	11	16	17	(19)	12	75	8.9	8.2
1971	11	15	19	(20)	11	76	8.7	8.0
1972	10	15	(21)	21	11	78	8.4	7.4
1973	8	16	(18)	16	15	73	8.8	7.7
MEAN	10	17	19	17	11	74	8.9	9.1
PEAK MONTH	0	6	14	9	0			

Peak Month	No. of Years	Percent	Mean Temp. °C	Mean Catch 10 ³ mt	Percent Annual Catch
August	6	21	10.3	10.0	22.3
September	14	48	9.5	8.9	19.8
October	9	31	8.3	8.8	19.5

Note: Percents in brackets are for the peak monthly catches for the year. In those months having the same percentage value, that with the highest catch was chosen.

Source: Robert L. Dow, Maine Department of Marine Resources.

which 9,027 tons (19.9 million pounds) were landed in New England states and 181 tons (0.4 million pounds) in the Mid-Atlantic states.

By 1892, more than 200,000 traps were in use in the U.S. fishery; and Maine had become the leading lobster producing state. At that time, there were 2,628 persons engaged in the fishery in Maine; and landings totaled 8,000 tons (17.6 million pounds). Other principal lobster-producing states in 1892 were Massachusetts, with 616 lobster fishermen and landings of 1,451 tons (3.2 million pounds); Connecticut, with 258 lobstermen and landings of 726 tons (1.6 million pounds); and Rhode Island, with 145 lobstermen and landings totaling 363 tons (0.8 million pounds).

Lobster canneries were an important element of the fishery during the later part of the 1800's. The first successful cannery in this country was built in Eastport, Maine in 1842; and by 1880 twenty-three plants were operating in the state. The importance of lobster canneries in the United States declined towards the end of the 1800's; the last cannery in Maine ceased operations about 1892. The live lobster trade developed commensurate with the decline in importance of canneries and presently 80-90 percent of the entire U.S. production is marketed live.

From the turn of the century into the 1940's, the fishery fluctuated, but there were no sustained dramatic changes in the amount of effort expended in the fishery. Over the period, the total number of traps fished ranged annually from about 250,000 to 350,000. However, in the post World War II era and particularly during the 20-year period from the late 1950's to the late 1970's, the fishery expanded rapidly. During that period, the number of traps fished in the traditional coastal fishery more than tripled to a record high of 2.1 million traps in 1978, and a new fishery developed in offshore areas.

As early as 1891, beam trawlers, and then later otter trawlers, occasionally landed lobsters taken incidental to fishing operations for various species of finfish (Schroeder, 1959); yet lobstering remained essentially a shoal water coastal trap fishery well into the 1950's. During the 1950's, increased demand for lobster and improvements in the technology of mobile gear (McRae, 1960) stimulated rapid development of an otter trawl fishery for lobster, principally around the canyon areas located in deep water along the continental margin off Southern New England. Reported landings of trawl-caught lobsters increased from about 128 metric tons (283,000 pounds) in 1950 to about 2,500 tons (5.5 million pounds) in 1965. The new fishery rapidly expanded from the Southern New England area, eventually stretching from Corsair Canyon on the eastern margin of Georges Bank to Norfolk Canyon off the Virginia coast. Otter trawl landings of American lobster peaked in 1970 at 3,199 tons (7.0 million pounds) and then declined sharply to 598 tons (1.3 million pounds) by 1976.

Success of the otter trawl fishery and the advent of hydraulic trap haulers during the 1960's stimulated the development of deep water trap fishing technology. By 1968, trap fishermen had extended their operations to depths greater than 90 meters (50 fathoms), principally in the area off Massachusetts and Rhode Island. During the 1970's, the deep water trap fishery expanded rapidly across the continental shelf in the area from Massachusetts to New Jersey and along the shelf edge from Lydonia to Norfolk

Canyons. Annual landings from the offshore lobster trap fishery have fluctuated between 2 and 3 thousand tons.

The Commercial Harvesting Sector

Output and user groups. The total United States catch of American lobster reached a high in 1981 of 17,004 tons (37.5 million pounds). With the average ex-vessel price increasing to \$2.31 in 1981, the total landed value of the catch was \$86.5 million. Although the price per pound has risen substantially in recent years, gains have not kept pace with the rise in prices throughout the economy. Between 1972 and 1979 wholesale prices in general increased by 86%, whereas lobster prices increased by only 58%, for a decline in total value from \$39.5 million in 1972 to \$36.4 million in 1979 (see Table IV.B.1).

Maine is the leading lobster-producing state, accounting for 22.1 million pounds (59 percent of total U.S. landings) in 1979 (Table IV.B.1). Massachusetts is a distant second with landings totalling 9.5 million pounds (26%), followed by Rhode Island with 2.3 million pounds (6%). New Hampshire, Connecticut, New York, and New Jersey landed a total of 3.1 million pounds (8%) collectively; and Delaware, Maryland, and Virginia collectively landed a total of 130,000 pounds (1%) in 1979.

Information concerning the distribution of fishing effort and the origin of catch between the FCZ and state territorial waters is somewhat unclear, since fishing patterns do not coincide with the boundaries established to delineate the FCZ from territorial waters. Although every attempt is made in collecting information to distinguish between the FCZ and territorial components of the fishery (Table IV.B.2), it is apparent that many "inshore" lobstermen devote at least a portion of their fishing effort, and derive a portion of their catch, from the FCZ. Because of unclear or unresolved boundaries, and because many fishermen fish in the FCZ and in territorial waters, differentiation of the fishery on the basis of inshore versus offshore can be confusing and misleading. Coastal fisheries for lobster may extend from three to twelve miles seaward of the territorial sea, although the majority of the fishery landings come from state waters. For this reason, the discussion will distinguish between coastal fisheries, which are primarily conducted within state waters but may have a component within the FCZ, and offshore fisheries, which are conducted entirely within the FCZ.

No record of a significant offshore fishery exists in Maine. The entire reported Maine harvest in 1979 was from coastal waters. The same applies to reported catches by New Hampshire fishermen; however, a number of Maine fishermen may operate almost exclusively in offshore waters landing their catch in New Hampshire.

Massachusetts supports a significant offshore fishery, which operates principally from the ports of Westport, Harwichport and Hyannis. Twenty-five percent of the total landings in 1979 were from offshore waters, with 65% of the offshore catch coming from the trap fishery (Table IV.B.3).

The major share of Rhode Island landings, 78 percent of the 1979 harvest, was harvested offshore. Of the offshore catch, 95 percent were taken by the offshore trap fishery.

Connecticut's fishery, conducted principally within Long Island Sound, is a coastal enterprise.

Table IV.B.1: Total Landings and Value of American Lobster
by State in Selected Years
(In thousands of pounds and thousands of dollars)

<u>State</u>	<u>1972</u>		<u>1975</u>		<u>1979</u>	
	<u>Pounds</u>	<u>Value</u>	<u>Pounds</u>	<u>Value</u>	<u>Pounds</u>	<u>Value</u>
Maine	16,257	18,588	17,008	27,479	22,133	39,901
New Hampshire	674	809	480	779	780	1,362
Massachusetts	8,032	10,276	6,734	12,101	9,553	19,804
Rhode Island	3,361	4,319	3,687	6,621	2,289	5,138
Connecticut	540	777	594	1,158	808	2,068
New York	1,145	1,825	669	1,400	703	1,852
New Jersey	1,308	1,828	851	1,555	805	1,727
Delaware	22	36	27	49	36	113
Maryland	21	26	59	106	93	238
Virginia	884	1,028	91	164	1	1
Totals	32,244	39,512	30,200	51,412	37,200	72,204
Total adj for WPI (rel 1972)		39,512		34,974		36,407

Source: Fishery Statistics of the United States, 1972 and 1975.
Preliminary 1979 information from NMFS, Gloucester.

Wholesale price information given in Table IV.B.10.

Table IV.B.2: Commercial Landings of American Lobster
by Distance Caught Offshore
and Approximate FCZ Harvest 1971-1981
(In Thousands of Pounds)

<u>Year</u>	<u>0 to 3 miles</u>	<u>3 to 12 miles</u>	<u>12 to 200 miles</u>	<u>Total Catch</u>	<u>Proportion from FCZ</u>
1971	22,256	2,354	8,467	33,347	32.4%
1972	21,088	442	7,748	29,278	27.9
1973	23,149	806	5,080	29,035	20.2
1974	20,484	1,947	5,835	28,266	27.5
1975	21,550	1,622	5,864	29,036	25.8
1976	23,109	3,184	5,448	31,741	27.2
1977	25,066		6,642	31,708	20.9
1978	27,202		7,217	34,419	20.9
1979	31,848		5,336	37,184	14.4
1980	32,566		4,333	36,952	11.7
1981	<u>33,058</u>		<u>4,436</u>	<u>37,494</u>	<u>11.8</u>
Totals	281,646		76,761	358,460	21.4

Source: Fisheries of the United States Annuals, 1971-1981.

Fifty-three percent of New York landings are from offshore areas, with 100 percent of the offshore landings taken by the trap fishery. Forty-four percent of New Jersey landings originate offshore. Ninety-five percent of those landings are from the trap fishery.

In Delaware, Maryland, and Virginia, the fishery is conducted almost exclusively in offshore waters. Only minor amounts are taken by the dragger fleet. North Carolina contributed some catch of lobsters from offshore waters in the late 1960's. Draggers that homeport in North Carolina traditionally fish offshore for lobster during part of the year, but usually land their catch in states to the north, particularly in New Jersey.

Fishing within the FCZ has been estimated by the National Marine Fisheries Service. In 1981, 4.4 million pounds (12% of the total U.S. 1981 catch), valued at \$10.3 million (average ex-vessel price of \$2.31 per pound) were taken more than three miles from shore. Rhode Island has traditionally been the leading state in lobster landings from the FCZ, but was surpassed in 1978 by Massachusetts. In 1979, Massachusetts had landings of 2.4 million pounds from the FCZ, while Rhode Island had 1.8 million pounds. Shifts in homeports of vessels from Rhode Island and Massachusetts have occurred in response to license and lobster size restrictions, as well as for other reasons, resulting in apparent fluctuations in the relative offshore landings of each state.

Operating units and employment. In 1979, a total of 10,513 vessels and 12,484 men were employed in lobster fishing. A great majority of these (10,325 vessels and 11,467 men) were employed in the coastal trap fishery (Table IV.B.4). These figures do not include persons employed in the distribution system, or in supply and support operations.

The total number of persons engaged in lobster fishing has increased substantially since the middle 1960's: 8,405 people in 1965 to a high of 14,736 by 1974, and down slightly over the last several years to 12,484 in 1979. Since 1968, the increases have been in the trap fisheries, while the number of persons engaged in the primarily offshore otter trawl lobster fishery declined from a high of 711 in 1968 to a low of 107 by 1978. The decline in the otter trawl lobster fishery is evident also in the number of otter trawl vessels employed in the fishery. There were 87 otter trawl vessels in the fishery in 1967, with 52 of these vessels fishing out of ports in Southern New England and 35 out of ports in New York and New Jersey. By 1978, the number of otter trawl vessels employed in the directed fishery had declined to 22 operating out of ports principally in Massachusetts (6 vessels) and Virginia (6 vessels), with the remaining 10 vessels divided between Rhode Island, New York, New Jersey and Maryland. The future trend of the number of otter trawl vessels employed in the lobster fishery will probably be influenced by management and market considerations in other fisheries, such as the groundfish fishery. Significant numbers of draggers, not considered active in the lobster fishery, land small quantities of incidentally caught lobsters which are generally apportioned among the crew as a bonus or "shack".

In the coastal trap fishery, over the period 1973-1979, there was no clear

Table 1V.B.3: Total Catch of American Lobster by State in 1979, and Proportion
Of the Catch by State and Origin by Harvest Method and Area
(Landings in Thousands of Pounds)

State	Coastal Trap Fishery		Offshore Trap Fishery		Offshore Dragger Fishery		Total Offshore Landings	
	Landings	% of Total	Landings	% of Total	Landings	% of Total	Landings	% of Total
Maine	22,133	100	-	-	-	-	-	-
New Hampshire	780	100	-	-	-	-	-	-
Massachusetts	9,553	75	1,528	16	840	9	2,368	25
Rhode Island	2,289	22	1,700	74	86	4	1,786	78
Connecticut	808	100	-	-	-	-	-	-
New York	703	47	374	53	1	-	375	53
New Jersey	805	56	337	42	18	2	355	44
Delaware	36	22	28	76	-	-	28	76
Maryland	93	0	89	96	4	4	93	100
Virginia	1	-	-	-	1	100	1	100
Total	37,201	87	4,056	11	950	2	5,006	13

Source: Figures are preliminary based on information from NMFS, Gloucester.

Table IV.B.4: Numbers of Vessels, Men, and Gear Employed in the Coastal Lobster Trap Fishery in Selected Years

State	1972			1975			1979		
	Vessels	Men	Traps	Vessels	Men	Traps	Vessels	Men	Traps
Maine	7,004	7,039	1,448,300	7,776	10,569	1,770,600	7,478	8,068	1,728,000
New Hampshire	225	277	16,000	284	368	23,400	263	320	34,500
Massachusetts	931	1,122	141,000	1,139	1,216	191,800	1,319	1,391	266,101
Rhode Island	243	289	32,700	252	507	36,400	276	608	40,543
Connecticut	514	758	33,800	516	716	24,400	494	574	23,094
New York	386	506	53,100	391	535	55,400	479	479	54,061
New Jersey	84	171	42,000	57	114	26,500	0	0	0
Delaware	8	19	600	1	1	10	5	5	150
Maryland	2	4	500	-	-	-	11	22	5,250
Virginia	5	33	6,000	-	-	-	-	-	-
Total	9,402	10,218	1,774,000	10,531	14,026	2,128,510	10,325	11,467	2,151,699

Source: Fishery Statistics of the United States, 1972 and 1975.
Preliminary 1979 information from NMFS, Gloucester, Massachusetts.

Information is collected and compiled by the Resource Statistics Branch in cooperation with the resource statistics agencies of the respective coastal states. In some cases, information is collected solely by NMFS.

trend in the total numbers of vessels, workers, and gear employed. Totals by state have fluctuated over this period, with the exception of Massachusetts and Rhode Island where steady increases were recorded in the numbers of vessels and gear employed through 1977. In Maine, the number of vessels employed declined from 7,893 in 1973 to 7,363 in 1978, while the number of licensed fishermen reached a high of 10,628 in 1974. The increase in licensed fishermen in Maine in 1974 was in part due to speculative purchasing of fishing licenses in anticipation of a moratorium on the issuance of new licenses by Maine in future years. Moratoriums have been applied in other states. Massachusetts restricted commercial licenses in 1975 and Rhode Island did so in 1978.

In the offshore trap fishery, the number of vessels, men, and gear employed increased steadily during the early years of the fishery, but declined from 1976 through 1979. In 1979, offshore trap vessels numbered 28 in Massachusetts, with 105 crewmen. In Rhode Island, 13 vessels employed 50 crewmen. New York had 12 vessels and 32 crewmen.

Delaware, Maryland and Virginia together supported 5 vessels with 12 crewmen.

Participation in the fishery. The lobster fishing industry is largely seasonal. Winter is traditionally viewed as a time to build and repair traps, overhaul boats, and prepare for the coming lobster season. In the winter months, storms and rough weather cause substantial gear losses and make trap hauling difficult and dangerous, particularly for the smaller vessels. In addition, due to seasonal fluctuations in lobster availability, many lobstermen choose not to set traps in the winter months, while others operate at a lower level of effort. Some lobstermen fish for other species during winter, while a great many lobstermen alternate their fishing with seasonal outside jobs.

Limited information on participation in the coastal fishery indicates that the level of participation varies sharply between a minority of full-time lobstermen and a majority of part-timers. Huq (1971) found that only 16.6 percent of the commercial lobstermen surveyed in four communities in Maine fished more than 150 days per year. Over half of the men surveyed fished less than 30,000 trap days (that effort equal to hauling one trap for one day); however, 6.5 percent of the men fished over 60,000 trap days yearly. Although they report a generally higher level of effort than found by Huq (1971) in Maine, Gates and DeEugenio (1975) obtained similar results in a survey of coastal commercial fishermen in Massachusetts. While the Massachusetts fishermen fished an average of 130 days and approximately 30,000 trap days per year, approximately 20 percent of the men surveyed averaged 221 days fishing and more than 80,000 trap days yearly. Smith (1977) reported that 86 percent of the coastal commercial lobstermen he surveyed in Connecticut fished an average of 6.3 months per year and averaged 90.5 hours per month in lobstering and related activities. The remaining 14 percent of the men surveyed in Connecticut fished an average of 9.2 months per year and spent an average of 196.7 hours per month in lobstering and related activities.

The relatively small proportion of full-time, large-scale fishermen among

Table IV.B.5: Numbers of Vessels, Men, and Gear Employed in the
Otter Trawl (all types) Lobster Fishery in Selected Years

State	1972			1975			1979		
	Vessels	Men	Trawls	Vessels	Men	Trawls	Vessels	Men	Trawls
Maine	-	-	-	-	-	-	8	28	8
New Hampshire	-	-	-	-	-	-	21	55	21
Massachusetts	10	60	10	18	114	18	48	114	48
Rhode Island	22	104	22	7	42	7	4	5	4
Connecticut	-	-	-	-	-	-	29	33	29
New York	17	62	17	12	43	12	17	34	17
New Jersey	32	120	32	17	53	17	-	-	-
Delaware	-	-	-	-	-	-	-	-	-
Maryland	-	-	-	-	-	-	1	2	1
Virginia	-	-	-	-	-	-	-	-	-
Totals	81	346	81	54	252	54	128	271	128

Source: Fishery Statistics of the United States, 1972 and 1975.
Preliminary 1979 information from NMFS, Gloucester,
Massachusetts.

Table IV.B.6: Numbers of Vessels, Men, and Gear Employed in the Offshore Lobster Trap Fishery in Selected Years

<u>State</u>	<u>1972</u>			<u>1975</u>			<u>1979</u>		
	<u>Vessels</u>	<u>Men</u>	<u>Traps</u>	<u>Vessels</u>	<u>Men</u>	<u>Traps</u>	<u>Vessels</u>	<u>Men</u>	<u>Traps</u>
Maine	-	-	-	-	-	-	-	-	-
New Hampshire	-	-	-	-	-	-	2	8	1,500
Massachusetts	11	82	4,100	32	124	19,500	28	105	14,900
Rhode Island	35	129	14,700	49	184	28,700	13	50	14,793
Connecticut	-	-	-	-	-	-	-	-	-
New York	-	-	-	9	27	5,700	12	32	11,180
New Jersey	-	-	-	16	35	8,800	-	-	-
Delaware	-	-	-	3	6	1,400	1	4	400
Maryland	-	-	-	4	9	2,600	4	8	2,400
Virginia	-	-	-	2	14	2,800	-	-	-
Totals	46	211	18,800	115	399	69,500	60	207	45,173

Source: Fishery Statistics of the United States, 1972 and 1975.
Preliminary 1979 information from NMFS, Gloucester, Massachusetts.

the coastal commercial lobstermen apparently are responsible for a major portion of the harvest. In Connecticut, 14 percent of the commercial lobster fishermen accounted for 78 percent of the 1975 commercial landings (Smith, 1977). On the basis of the gross incomes of fishermen surveyed in Maine, Huq (1971) established that eight full-time lobstermen are the equivalent of 32 part-time lobstermen.

Because entry into the coastal lobster fishery does not require substantial cash investments and experience in fishing, there is considerable participation in the coastal commercial fishery by students, retired persons, and by individuals with alternative full-time employment. Although there are notable exceptions, these "part-time" participants, in general, operate at a low level of effort. In addition, some career lobstermen in the more rural areas, in particular, operate at a low level of effort but are content with the lifestyle and income thus generated. While the contribution of lobster fishing to total income of some "part-time" fishermen may be substantial, it is likely that many part-timers engage in commercial lobster fishing primarily for recreational purposes; that is, as a hobby or avocation. Smith (1977) found that 48 percent of the part-time fishermen interviewed in Connecticut derive little or no income from the fishery.

While no comprehensive data exist on annual participation in the offshore fishery, the much larger investments involved, the size of the companies competing, and the larger boats employed, all tend to make it a full-time effort. Seasonal variations in effort occur in the winter months when traps are hauled out due to declining catch rates and to minimize gear loss in storms. The magnitude of investment required to successfully operate in the offshore fishery probably precludes any but the serious full-time operators from entering.

Secondary or incidental fisheries. Rock crab (*Cancer irroratus*), Jonah crab (*C. borealis*), red crab (*Geryon quinqueedens*), and black sea bass (*Centropristis striata*), among other species, are taken incidentally in the directed commercial lobster fisheries (Table IV.B.8). Similarly, lobster may frequently figure significantly as by-catch in directed fisheries for other species. No information is currently available regarding incidental catches in the recreational fisheries for lobster, but they should follow generally the trends in commercial fisheries conducted nearby.

Ganz (1975) summarized the findings of three studies conducted in the area from Southern Maine to Rhode Island to assess the potential for developing a fishery for northern crabs, and concluded that only about nine percent of the crabs taken by lobster fishermen were landed, with an additional eight percent killed for lobster bait. The most recent NMFS statistics available suggest that the proportion of crabs taken in lobster gear and landed may be increasing. Briggs (1979a) discussed trends of landings of Jonah crabs in New York and demonstrated significant growth in landings, which rose from 18,000 pounds in 1975 to 285,000 pounds in 1977 while average price per pound remained fairly constant at about 29 cents per pound.

In 1978, slightly over 12 percent of the ex-vessel revenue from New England offshore traps was attributable to catches of other species, with about 10 percent, the greatest portion, from directed and incidental fisheries for red crab. In the Mid-Atlantic area, black sea bass is the most important

Table IV.B.7: Total Number of Lobster Fishermen by State for Selected Year,
With Full-Time and Part-Time Component Estimate

State	1972				1975				1979			
	Total Lobster-men	Full-Time	Part-Time or Casual	% Of Total Full-Time	Total Lobster-men	Full-Time	Part-Time or Casual	% Of Total Full-Time	Total Lobster-men	Full-Time	Part-Time or Casual	% Of Total Full-Time
Maine	7,039	3,681	3,358	52	10,569	3,482	7,087	33	8,361	3,409	4,952	41
New Hampshire	277	65	212	23	368	68	300	18	398	153	245	38
Massachusetts	1,264	1,056	208	84	1,454	1,405	49	97	1,695	1,453	242	86
Rhode Island	522	403	119	77	733	525	208	72	618	365	253	59
Connecticut	758	136	622	18	716	148	568	21	608	162	446	26
New York	568	353	215	62	605	350	255	58	513	34	479	6
New Jersey	291	284	7	98	202	202	-	100	-	-	-	-
Delaware	19	8	11	42	7	6	1	86	9	4	5	44
Maryland	4	4	-	100	9	9	-	100	282	76	206	27
Virginia	33	33	-	100	14	14	-	100	-	-	-	-
Total	10,775	6,023	4,752	56	14,677	6,209	8,468	42	12,484	5,656	6,828	45

Source: Fishery Statistics of the United States, 1972 and 1975.
Preliminary 1979 information from NMFS, Gloucester, Massachusetts.

In "Fishery Statistics of the United States", full-time fishermen are defined as those individuals who derive more than 50 percent of their annual income from fishing.

Table IV.B.8: 1978 New England and Mid-Atlantic Directed Lobster Fisheries
Lobster and Incidental Species Catches and
Relative Contributions of These Catches to Ex-Vessel Values of Fishing Gears' Total Catches
(Thousands of Pounds and Thousands of Dollars)

	New England ^{1/}			Mid-Atlantic and North Carolina ^{1/}		
	Pounds	Dollars	% Of Total Gear ^{2/} Ex-Vessel Value	Pounds	Dollars	% Of Total Gear ^{2/} Ex-Vessel Value
Total Lobster Catch	32,749.8	61,291.7		1,580.5	3,482.4	
Directed Lobster Catch ^{3/}	32,237.0	60,222.6	97.73	1,558.8	3,436.7	96.83
Inshore Lobster Pots						
Lobster	27,845.5	50,876.0	99.50	660.2	1,517.7	94.99
Rock Crab	1,836.7	255.5	0.50	22.7	3.0	0.19
Jonah Crab	-	-	-	177.7	26.7	1.67
Black Sea Bass	-	-	-	66.4	44.4	2.78
All Other Species	1.9	1.5	-	40.3	5.9	0.37
Offshore Lobster Pots						
Lobster	3,865.8	8,110.6	87.77	866.4	1,854.1	98.37
Rock Crab	67.6	20.0	0.22	58.9	7.3	0.39
Jonah Crab	828.8	175.4	1.90	87.7	13.2	0.70
Red Crab	2,702.4	918.1	9.94	5.7	2.5	0.13
Black Sea Bass	-	-	-	2.7	1.3	0.07
All Other Species	14.3	16.0	0.17	43.9	6.4	0.34
Lobster Trawls						
Lobster	509.3	1,204.6	98.96	31.0	62.2	97.07
Rock Crab	-	-	-	7.2	0.6	0.08
All Other Species	50.2	12.7	1.04	6.5	1.2	1.05
Diving Gear Lobster	16.3	31.4	100.00	1.2	2.8	100.00

^{1/}New England: Maine and Connecticut. Mid-Atlantic: New York and Virginia.

^{2/}The first figures in each of these two columns reflect the contribution of the total directed lobster catch to the aggregate ex-vessel catch value from the fishing gears listed.

^{3/}Defined as all lobster catches taken with the listed fishing gears.

Table IV.B.9: 1978 Incidental Lobster Catches in New England and the Mid-Atlantic Region and Relative Contributions of These Catches to Ex-Vessel Values of Fishing Gears' Total Catches (Thousands of Pounds and Thousands of Dollars)

	New England ^{1/}			Mid-Atlantic and North Carolina ^{1/}		
	<u>Pounds</u>	<u>Dollars</u>	<u>% Of Total Gear^{2/} Ex-Vessel Value</u>	<u>Pounds</u>	<u>Dollars</u>	<u>% Of Total Gear^{2/} Ex-Vessel Value</u>
Total Lobster Catch	32,749.8	61,291.7		1,580.5	3,482.4	
Incidental Lobster Catch ^{3/}	512.8	1,069.1	1.46	21.7	45.7	0.18
Lobster Catches By						
Fish Trawls	512.8	1,069.1	1.46	11.5	24.1	0.20
Fish Pots	-	-	-	9.2	19.8	3.87
Scallop Dredges/Trawls	-	-	-	1.0	1.8	0.01

^{1/}New England: Maine and Connecticut. Mid-Atlantic: New York and Virginia.

^{2/}The data in this table has been taken from unpublished NMFS statistics which summarize landings by county and by fishing gear. Only landings from those counties with reported lobster landings for a particular fishing gear have been used. The first figures in each of these two columns reflect the contribution of the total incidental lobster catch to the aggregate ex-vessel catch value from the fishing gears listed.

^{3/}Defined as all lobster catches not taken with lobster pots, lobster trawls, or diving gear.

by-catch species to inshore pot fishermen, while Jonah crab is the most valuable to offshore pot fishermen.

It is believed that during the late 1950's and early 1960's, substantial unreported quantities of red crabs were taken by otter trawl, usually while searching for lobsters along the upper slope area on the edge of the continental shelf. Red crabs apparently prefer a greater depth statum than do lobsters, and the two species are seldom found in concentration on the same bottom at the same time. Directed trawl and trap fisheries for red crabs developed principally in the area from Veatch Canyon to Hudson Canyon; and although the trawl fishery has stopped due to the high mortality among trawl-caught red crabs, a trap fishery continues. An unknown but presumably very small portion of lobster landings are incidental to red crab fishing.

Black sea bass are taken in lobster pots from Massachusetts to New Jersey. Similarly, lobster is taken in the fish pot sea bass fishery from New Jersey through Maryland. Briggs (1979a), however, states that the participants in the pot fishery off the south shore of Long Island cannot be categorized as either lobster or sea bass fishermen. Overall, in the Mid-Atlantic area in 1978, black sea bass catches in inshore and offshore traps provided slightly more than 1 percent of the total ex-vessel revenues from those gears.

Investment, gross income, and returns to capital and labor. There is no published information on the magnitude of investment in the lobster fishery or in the processing sectors at this time. The Canadian Government has done some work in this field, and a few studies have been performed in the U.S. Unfortunately, most of this work is either outdated or was directed only at one state's fishery. As a consequence, for purposes of the economic analysis it was necessary to estimate values for enterprise investments for the various fisheries by using time series information and adjusting values with a price index. The method employed allows a rough approximation of the actual financial conditions.

The inshore trap fishery, according to preliminary National Marine Fisheries Service data, was conducted with 10,325 boats in 1979. These boats tended 2,151,699 traps, which resulted in a catch of 14,600 tons (32,195,000 pounds) of lobster. Investments in coastal lobster fishing enterprises can be as small as the purchase of a few traps and a small outboard motor boat, or as large as that of several individuals described in Acheson in 1972, with over \$45,000 invested. Adjusting Acheson's value to keep pace with rising prices, that investment would be the equivalent of about \$85,000 in 1979. If each boat is considered to be an enterprise consisting of boat, equipment, traps, and shore facilities with an average value of \$16,000, then investment in this fishery is on the order of 160 million dollars.

The offshore trap fishery, with 60 vessels participating, produced a reported catch of 4,056,000 pounds of lobster with 45,173 traps. Offshore traps are fished in trawl lines of varying lengths. In moderate depths, 20 to 30 traps are commonly joined to form each "trawl line". Further out to sea, trawl lines may have 25 to 50 traps each, while some lines, fished in even deeper waters, may consist of 75 to 100 traps. When the value of traps, lines, buoys, and radar reflectors is totaled, a single string can be worth up to \$10,000, although the value is entirely dependent on the length of the trawl and the type of traps used. Offshore trap vessels can be built at a

cost of from \$250,000 to \$750,000. Some vessels are draggers or Gulf shrimpers which have been converted to trap fishing. In recent years, new vessel construction for the offshore trap fishery has been predominantly in the 60 foot class. Using a value of \$250,000 for a typical vessel presently in the fishery, and \$50,000 for traps per enterprise, the investment in an individual outfit can be figured at nearly \$300,000. For the offshore trap fishery as a whole, the investment is on the order of 34 million dollars. This estimate does not include shore facilities such as lobster storage tanks, maintenance shops, or piers.

The offshore dragger fishery involved 128 vessels in 1979 with total landings of 950,000 pounds of lobster. If each dragger is assumed to have a value of about \$350,000, the total investment in the offshore trawl fishery is on the order of 8 million dollars. This amount is misleading, however, because the equipment is easily converted for use in other fisheries, or may in fact be in use in fishing operations involving other species. The considerable fluctuation in number of vessels engaged in the fishery would seem to support the contention that these participants and the investment are relatively mobile.

Using these figures as a base, total capital investment in the lobster fishery can be estimated at approximately 202 million dollars.

Preliminary data collected by the Department of Commerce indicates that the value of U.S. commercial lobster landings of American lobster in 1979 was 65 million dollars. This is the ex-vessel value, and thus provides a measure of the gross income for the fishery. The accuracy of this measure of gross income is, of course, dependent upon the accuracy of the landings estimates.

Lobster fishing is very dependent on the availability of fuel, both to allow vessels to steam to often distant grounds and tend their traps, and as a component in manufacturing items of fishing gear such as nylon twine and rope. Thus, increases in the cost of fuel and manufactured petroleum-based products erode the profitability of lobstering operations.

The average gross return from lobster fishing to operating units is estimated to be as follows:

Coastal Trap Fishery - Gross revenue ranges from only a few hundred dollars for many to as much as \$45-50,000 for a few full-time operators. A rough average for the group is obtained by dividing the total catch value of \$62,458,000 among 10,325 enterprises yielding \$6,049 per enterprise. It should be emphasized that in the coastal trap fishery the variation in individual gross revenues is extremely wide.

Offshore Trap Fishery - Gross revenue ranges from \$10-20,000 for some to as much as \$350,000 for the highliners. Active year-round operators probably expect revenues from \$150-250,000. A rough average for the group is obtained by dividing the total catch value of \$7,868,640 among 60 enterprises yielding \$131,144 per enterprise.

Offshore Otter Trawl Fishery - Gross revenue ranges from perhaps \$20,000 for some to as much as \$200,000 for the most active. Average revenues have

increased because the number of participants has declined, leaving only serious and experienced operators. A rough average for the group is obtained by dividing the total catch value of \$1,843,000 among 128 enterprises yielding \$14,398 per enterprise.

Gates and D'Eugenio (1975) discussed the returns to fishermen in the Massachusetts inshore fishery. Their findings suggest that returns to labor and capital are frequently below what would be expected in other industries. Many lobstermen view the fishery as a means to create a job for themselves and perhaps a crew and to enjoy an independent work style. Many continue long established family traditions. The fishery provides a nearly unique opportunity for rewarding self-employment, and to build up equity in a business through continued hard work. Thus, while some lobstermen might find jobs which could pay them more, or more lucrative investments for their savings, such opportunities would likely not offer the independence, the possibility to build a business, and other important individual benefits that these persons desire.

Because most coastal lobster boats are owner-operated, returns to labor and capital are usually lumped together. If prevailing wage rates were paid in the lobster industry, many of the enterprises would operate at a loss, often a substantial one. Many of the enterprises, however, are not limited to lobster fishing, and seasonal supplements to revenue may come from involvement in winter dragging for flatfish, and spring gillnet and trawl line groundfish fisheries.

The offshore fishery, because the boats are frequently larger and use hired labor, must by necessity generate operating revenues which cover costs. Risks to equipment in the offshore trap fishery are very high, with life expectancy of traps being one year or less. Draggers frequently cut or destroy trap lines, causing the loss of substantial investments in trap gear. Loss of gear to foreign offshore fishing has become a significant issue in recent years. On occasion, some trap boats lose gear by misplacement or navigational error, although recent advances in electronic navigational equipment have improved the situation greatly. When two or more trawl lines are crossed when set, the hauling of one trap line at a future time often causes damage to the other lines. A management study of offshore trap lobstering (Business Policy: Text & Cases 1973) suggested that the industry may have considerable profit potential. However, the possibility of heavy gear losses, entry of large numbers of inexperienced operators, and the lack of knowledge concerning the resource base being exploited have made the industry a risky one.

Offshore dragging is attractive because of the relatively small investment needed to adapt a groundfish vessel to lobster trawling, in most cases the installation of some type of holding facility for the lobster is insufficient. The product is often of uncertain quality; as much as 30 percent of the catch can be damaged due to rough handling during the harvesting operation. In summer, a high proportion of the catch may be lost aboard vessels not equipped with adequate storage facilities. In addition, damage to individuals which are not harvested may be considerable. For these reasons, this harvesting method is less attractive than trapping from a resource conservation standpoint. No information on returns to capital and

labor exists for this fishing method. Because the investment is easily transferred to other facilities, participants in the fishery can be assumed to be operating profitably, or they would tend to leave the fishery or devote more effort to other, more lucrative pursuits.

Related fisheries. Although American lobster is a relatively unique product in the marketplace, a number of alternative supplies of fisheries products with similar characteristics and appeal are available.

1. Spiny lobster. In 1981, U.S. landings of spiny lobster were 6.6 million pounds, down slightly from 1980. Of the total, 94 percent was taken in Florida, the remainder in Hawaii and California. Landings have recovered over the last few years, from a sharp decline in 1978. The ex-vessel price was higher than that of American lobster, probably reflecting the smaller harvest. The average 1981 value was \$2.90 per pound. A management program for the spiny lobster resource was recently implimented.

2. American lobster from Aquaculture. Interest in the aquaculture of American lobster has been high since the middle 1960's. Serious scientific study, funded by various government agencies and private interests, has occurred since the early 1970's. While a number of serious problems have apparently been resolved, food supply and temperature maintenance are critical considerations. Rising energy costs could negatively affect the development of the industry.

At present, study continues and operations with prospects for commercial production within the next several years are located both on the West coast and in New England. It is likely that any operations which do develop will attempt to supply lobster through food service or other mass marketing channels. The need to raise and market the lobsters as quickly as possible to reduce costs will likely influence the supply; it will probably be of relatively small lobsters in a unit portion configuration. Other possibilities, including lobster mariculture, or the release of relatively large individuals into the ocean environment, are under examination. It will likely be several years before any results are seen.

3. Crabs. Several crab species are important supplements, substitutes, or competitors in the lobster market. Total crab landings in 1981 were 446.0 million pounds, down from records in 1979 and 1980, but value was up to 296.6 million dollars.

Blue crabs are important regionally in the Chesapeake, South Atlantic and Gulf states. Supplies have fluctuated in recent years in the different producing areas, and concerns over health effects from improperly handled crabs has hurt sales in some areas. Total 1981 landings were 195.1 million pounds valued at 46.4 million dollars, an increase of 20 percent in volume and 32 percent in value over the previous year.

Dungeness, King and Tanner crabs produced on the West coast represent a considerable volume of high value product. The 1981 landings of Dungeness crabs were down significantly from record 1977 landings, at 35.6 million pounds, and have fallen steadily for several years. Value was up 35% from 1980, to a total landed value of 29.1 million dollars.

The King crab fishery collapsed in 1981. Landings of 88.1 million pounds valued at 157.7 million dollars represented a drop of over 50% in harvests, from the record 1980 season. Ex-vessel price responded to reduced landings by doubling to 1.72 per pound in 1981.

Tanner crab landings in 1981 were 107.5 million pounds with a value of 47.3 million dollars. Both figures represented declines of 12-14 percent from 1980 figures, a departure from the rapid growth this fishery had enjoyed.

Related industries. Although the lobsterman supports a wide variety of service and supply related industries, two are particularly important.

1. Bait. The bait industry is extremely important because it is often a major part of the lobsterman's expenses.

Each locality has a different preferred bait, but the species used is generally determined by availability and price. Lobstermen may use menhaden, windowpane, skate, alewives, dabs, herring, cunner, sea robins, sea bass, crabs, hake, and redfish. The source varies, but lobstermen often catch at least part of their own bait. Other supply comes from boats which fish specifically for bait. The primary source is in the form of offal from fish houses and processors. Fish heads, frames, discards and "racks" are packed in barrels and sold to the fishermen. A combination of factors has made bait harder to get and more costly. Redfish racks were a prime source of bait, particularly in Maine, and the decline of that fishery since the loss of access to prime Canadian grounds (as a result of the extension of fisheries jurisdiction by Canada) has cut the supply of the racks. A long-term problem results from the use of fish frames in more efficient meat recovery systems, so that more meat is taken for the consumer and less is available for the bait. Use of fish in industry and for food which was earlier discarded as bait is also constricting supply and the competition with other high value users is driving up the lobstermen's price. The industry is not well organized, and recognized suppliers are few. Large packing or freezing plants are the major suppliers. A total of 350,000 barrels of bait worth 25-30 dollars each is estimated to be sold each year. Use of management measures in other fisheries, such as larger mesh nets, could reduce the supply of bait fish. The price and supply of bait are major factors in the variable costs of lobstering. Higher prices or reduced supply could cause a reduction in traps hauled, or a rise in lobster prices.

2. Traps. There are well over two million traps in service in the lobster fishery, and with an average service life of three years, a significant number of new traps are needed each year. Many lobstermen make their own traps from pre-cut materials provided in kits or by local sawmills. A number of firms make traps for sale. It is estimated that 30-35 firms are involved, with annual sales of perhaps 4 million dollars. Total employment is probably 120-125 persons. The firms produce traditional wooden pots, as well as molded plastic and vinyl coated wire pots. Traps have a value of 18 to 25 dollars each on the average, so the total value of traps used in the industry, if purchased from commercial sources, would be a significant sum.

Processing, Marketing and Consumption

By far the largest portion, approximately 87 percent, of the domestic catch of American lobster is marketed live or freshly cooked at the point of final sale. The remaining portion is marketed as fresh or frozen meat which has been shucked from lobsters which become weakened or injured at various points in the distribution chain. In addition, in the Mid-Atlantic region, some lobster is marketed as lobster parts. Only a small proportion of the lobster industry does any type of processing. Although the number of steps in the distribution chain is variable by geographic region, in general the individual fisherman sells his catch to a dealer, who will hold the lobster for sale to a wholesaler. These wholesalers in turn market the lobster either to restaurants, retail outlets or institutions.

In areas such as Maine, where the coastline is marked with many protected indentations subject to tidal flushing, tidal impoundments as well as floating "lobster cars" are used to store live lobsters until they are distributed to dealers or wholesalers.

A more recent and more common storage method, both for the producers and dealers at various points on the chain of distribution, is the use of circulating sea water tanks which may, depending on the climate and region, be temperature controlled. In inland regions, artificial sea water prepared from commercially available mixtures is commonly used in these tanks.

The tidal impoundments, or lobster pounds, serve a number of purposes, depending on both the current market for lobster and the season. At times, pounds are used for extended storage of lobsters, either to allow recently molted lobsters to harden their shells, or to serve to level the market in periods of slack supply or demand. A number of large storage facilities serve a speculative purpose, holding lobster in expectation of price advances. Some pounds may recently have begun to hold lobster through molt periods when the weight and value can increase significantly. Because lobster catch is dependent on the season, pounds are used primarily to maintain a steady supply in the face of variable production rates. Lobster cars and tanks serve as short-term storage facilities and for holding of daily shipments to market.

Bulk lobster shipments are transported by truck and by air, in specially constructed insulated packages made of fibreboard or styrofoam. Recently, air shipment of small quantities by order to individual consumers has picked up, and the use of express air or postal delivery has drawn great interest for reducing shipping costs.

The apparent value of the lobster catch has increased steadily in recent years. In 1981, the value to the fishermen of domestic commercial landings was \$86.5 million, up from \$33.5 million in 1970. The average ex-vessel, or per pound price received by fishermen for their catch, has increased from \$.98 per pound in 1970 to \$2.31 per pound in 1981. However, if the trend in ex-vessel prices of lobster is compared to other prices, it becomes apparent that increases have barely kept pace with the general trend, and that lobster prices have risen only a fraction of what other fishery product prices have done (Table IV.B.10).

Vessel prices fluctuate seasonally, from a low in early fall to a high in mid-winter when fewer lobsters are taken and holiday season demand is high (Figure IV.B.1). Prices fall again in mid-April as supply is augmented with imports and domestic landings pick up from the winter slump.

Different sized lobsters command different prices per pound at the market, depending on the season and demand. The smallest legal sized lobsters, known as chickens and weighing about one pound, are generally the least valuable per pound next to culls or damaged lobsters, although in certain seasons and more recently demand for them has driven their price above that for other categories. Prices increase with the size of the lobster until a threshold size, about three pounds, is reached. Above this size, the lobster is too big to serve easily and without waste, and the price per pound decreases somewhat.

At the wholesale level, lobster prices are influenced less by season. This probably reflects the action of speculative pounding and storage, seasonal augmentation of supply with imports, as well as the greater ability of wholesalers to maintain prices at a level they desire. Wholesale prices have generally been 40 percent higher than ex-vessel values, although they fluctuate. A study of wholesale margins by the Massachusetts Lobstermen's Association revealed a range of from 19 to 150 percent depending on the season, dealer, and market. Wholesalers argue their margin has declined with the rising price of lobster as consumers have been less willing to pay the prices, and the dealer has trimmed his margin to make up the difference.

Because a major portion of the lobster sold is served by restaurants and other institutions, the retail market and retail price are difficult to evaluate. Institutions and restaurants require generally stable or predictable supplies of lobster, which makes the quantity remaining for retail sale very sensitive to changes in landings. Thus, the retail price and availability can be highly variable, depending on fluctuations in supply.

In addition, retail prices for the live product may vary widely depending upon both season and geographic region. While lobster can be purchased by consumers at near ex-vessel prices from lobstermen in the producing coastal areas, the price in other parts of the country or in retail establishments is often several times higher.

Processed lobster prices reflect the considerable loss which occurs from live weight to meat weight of lobsters. Hard shell lobsters will yield approximately 20 percent of their weight in meat. Recently molted lobsters will yield only about 12.5 percent of edible meat. Fresh cooked meat may be worth more than 18 dollars per pound. In contrast, canned and prepared products containing relatively small quantities of meat processed from cull or damaged lobsters may sell for prices below 2 dollars per pound.

Product distribution. The distribution chain for American lobster consists of several steps. The lobsterman sells his catch to a dealer or a buyer. The dealer then sells his stock to a wholesaler. Dealers often function as wholesalers. Wholesalers and brokers market their stock either to retail outlets or to restaurants. Lobster coops frequently operate as dealer-wholesalers, eliminating outside middlemen. Because few alternative outlets exist for many lobstermen, the wholesaler frequently has the ability

Table IV.B.10: Index of Lobster Ex-Vessel Prices
Related to Various Other Price Indexes

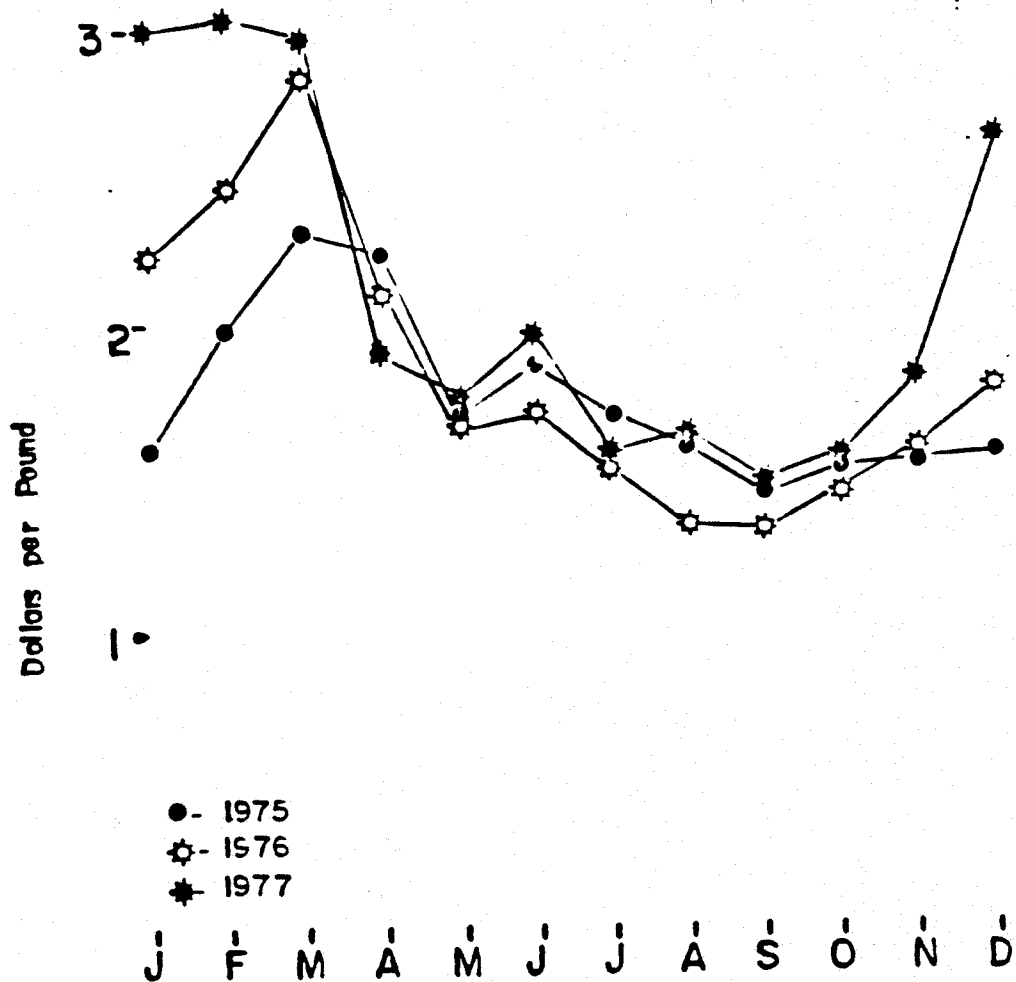
<u>Year</u>	<u>Consumer Price Index</u>	<u>Retail Fish Price Index</u>	<u>Ex-Vessel Fish Price Index</u>	<u>Ex-Vessel Lobster Price Index</u>
1965	95	91	94	87
1966	97	97	102	90
1967*	100	100	100	100
1968	104	102	113	93
1969	110	107	124	102
1970	116	118	130	117
1971	121	130	141	125
1972	125	142	166	146
1973	133	163	227	171
1974	148	188	239	178
1975	161	203	240	201
1976	171	227	299	216
1977	182	252	340	245
1978	195	273	391	264
1979	217	209	445	263
1980	247	160	400	278
1981	272	146	431	304

*By definition, indexes standardize on prices prevailing in 1967.

The fish price indices consider and are composed of all fish and shellfish species.

Source: Fisheries of the United States Annuals, 1965-1981.

Figure IV.B.1 - U.S. American Lobster Ex-Vessel Price by Month

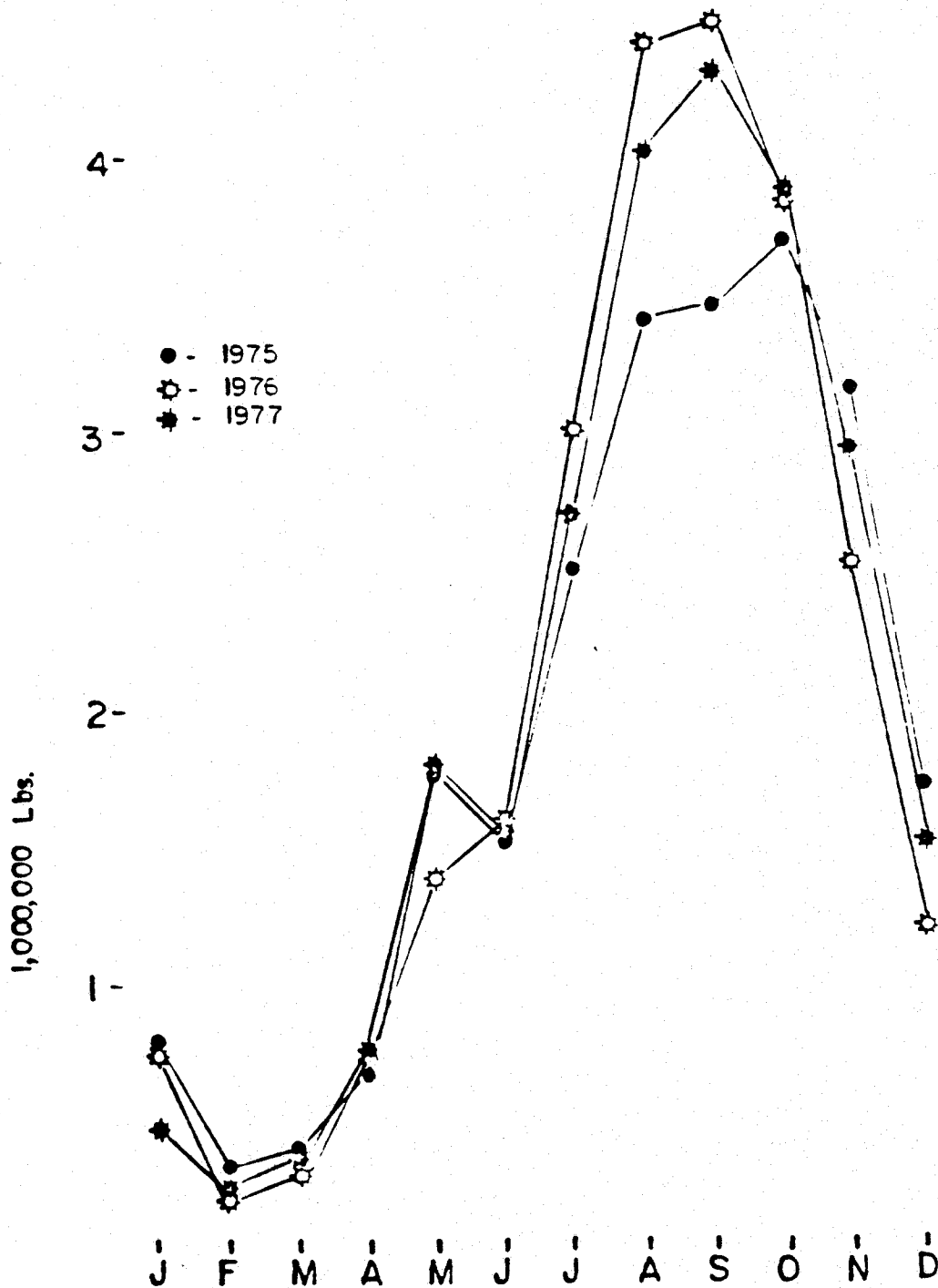


U.S. AMERICAN LOBSTER EXVESSEL PRICE BY MONTH
1975 - 1977

(In Dollars per Pound)

Source: Shellfish Market Review, NOAA, 6-77

Figure IV.B.2 - U.S. Landings of American Lobster by Month



U.S. LANDINGS OF AMERICAN LOBSTER BY MONTH
1975 - 1977
(In Millions of Pounds Landed)

Source: Shellfish Market Review, NOAA, 6-77 & 11-78

to make the market. Wholesale prices tend to reflect differences in handling and transportation costs between the major markets, but are otherwise equalized (Dow, 1961).

The 1978 NMFS wholesaler census identified 190 wholesalers handling American lobster throughout the country (Table IV.B.12). While no information exists at this time to identify total volume of lobsters handled, the wholesalers probably handle most of the lobster marketed. Exceptions would be lobsters sold by lobstermen directly to restaurants or to individual consumers on the coastline.

Because lobstermen must often deal with only one local wholesaler-dealer, and because firms at this level frequently augment their sales with imported product and maintain storage of lobsters for speculation, the wholesalers' operation has potential to be very profitable (Dow, 1961).

Markets. The lobster industry is characterized at the final market level by the small number of major sellers involved. Several large New England dealers control the marketing of a significant portion of the total available production.

At the wholesale-dealer purchasing level, prices are set, as in many other fisheries, by close but informal relationships among the dealers. Among other considerations, consistent high quality of a standardized product can bring better prices anywhere on the chain. In the winter months through early spring, a seller's market generally prevails. As supplies increase with increased production, this situation changes. The market has developed a number of stabilizing forces. Canadian Government regulated seasons for lobster are staggered, serving to prevent gluts on the overall lobster market and to maintain price stability. For example, in 1975, most of the seasons (there were 21 separate districts, each with different seasons, size, and trap limits) ran from mid-April or May through the end of June or July. This results in most Canadian lobsters being taken when U.S. supplies are just coming into the market and early summer demand is growing. The seasons also ensure that lobster from Canada enters the U.S. market when prices would otherwise be much higher due to a shortage of domestic product. This has the effect of reducing U.S. fishermen's potential income.

One lobster product does have a lack of well-organized market outlets. Processed meat derived from lobsters damaged or weakened in the distribution chain is variable in supply. Thus, dealers complain they must often sell the product at a loss because no efficient marketing channels exist.

Although in years past the Fulton Fish Market absorbed much of the Maine and Canadian production, that situation has changed with the growth of direct air shipment of lobster from dealers and wholesalers. At present, the Boston dealers control the largest portion of the lobster market by direct shipment. The Massachusetts catch is consumed primarily in local areas or utilized by the Boston market. The other coastal states, including Rhode Island, New Hampshire, Connecticut, and New Jersey all produce less lobster than is consumed locally; thus, they rely on supplies from Maine and Canada. Considerable quantities of American lobster are marketed as far south as Miami, and with the increasing use of air transport, live American lobsters

Table IV.B.11: U.S. Landings and Value of American Lobster
With Average Ex-Vessel, Wholesale and
Retail Prices Inferred 1960-1981

<u>Year</u>	<u>Landings</u> <u>(Million Lbs.)</u>	<u>Value</u> <u>(Million Dollars)</u>	<u>Ex-Vessel</u>	<u>Average Price (\$/Lb.)</u>	
				<u>Wholesale</u>	<u>Retail</u>
1960	31.2	14.3	.46	.89	1.29
1961	28.0	14.6	.52	1.00	1.42
1962	29.5	15.0	.51	.97	1.40
1963	30.3	16.8	.55	.98	1.49
1964	31.0	19.9	.64	1.17	1.64
1965	30.2	22.0	.73	1.31	1.89
1966	29.5	22.3	.76	1.36	1.96
1967	26.7	22.4	.84	1.48	2.13
1968	32.6	25.5	.78	1.39	2.00
1969	33.8	29.0	.86	1.51	2.18
1970	34.2	33.5	.98	1.69	2.45
1971	33.7	35.4	1.05	1.81	2.60
1972	32.2	39.7	1.23	2.08	3.00
1973	29.0	41.7	1.44	2.41	3.47
1974	28.5	42.8	1.50	2.50	3.60
1975	30.2	51.0	1.69	2.80	4.02
1976	31.5	52.3	1.66	2.75	3.96
1977	31.7	57.7	1.82	3.00	4.31
1978	34.4	64.6	1.88	3.09	4.44
1979	37.2	72.3	1.94	3.18	4.58
1980	36.9	75.2	2.04	3.35	4.83
1981	37.5	86.5	2.31	3.80	5.45

Values for prices are calculated or inferred.

Source: Fisheries of the United States Annuals 1960-1981.

Table IV.B.12: Firms Which Reported Handling American and Spiny Lobster
At the Wholesale Level, By State, in 1978

<u>State</u>	<u>Spiny</u>	<u>American</u>
California	17	2
Connecticut	-	5
Florida	34	-
Hawaii	3	-
Illinois	3	2
Indiana	1	-
Iowa	1	1
Maine	-	111
Maryland	-	1
Massachusetts	-	28
Michigan	2	-
Minnesota	1	1
Nebraska	1	-
New Hampshire	-	2
New Jersey	-	7
New York	2	21
North Dakota	-	1
Ohio	1	1
Rhode Island	-	7
Wisconsin	<u>2</u>	<u>-</u>
Total	68	190

Source: 1978 NMFS Wholesaler Census.

Table IV.B.13: Firms Which Reported Processing American
and Spiny Lobster, by State, in 1978

<u>State</u>	<u>Spiny</u>	<u>American</u>
California	2	-
Connecticut	-	3
Florida	19	-
Georgia	3	-
Maine	-	16
Massachusetts	-	12
Michigan	-	1
Minnesota	1	-
New Hampshire	-	3
New Jersey	1	2
Rhode Island	<u>-</u>	<u>6</u>
Total	26	43

Source: 1978 NMFS Processor Census.

Table IV.B.14: U.S. Supply of American Lobsters 1970-81
(Round Weight)

Year	U.S. COMMERCIAL LANDINGS			IMPORTS			TOTAL	
	Quantity	Thousand Pounds	Percentage of Total Supply	Fresh & Frozen	Canned	Total	Total Supply	
			Percent				Percentage of Total Supply	Thous. Pounds
							Percent	
1970	34,152		53.1	19,124	11,048	30,172	64,324	
1971	33,688		49.4	23,894	10,635	34,529	68,217	
1972	32,244		52.8	18,811	10,032	28,843	61,087	
1973	28,991		52.9	18,113	7,656	25,769	54,760	
1974	28,543		53.3	17,586	7,392	24,978	53,521	
1975	30,200		52.3	18,325	9,243	27,568	57,768	
1976	31,483		51.9	19,176	9,957	29,133	60,616	
1977	31,708		52.4	16,944	11,818	28,761	60,469	
1978	34,419		55.9	16,468	10,648	27,116	61,535	
1979	37,184		54.5	22,790	8,307	31,097	68,281	
1980	36,952		53.4	22,503	9,699	32,202	69,154	
1981	37,494*		48.2	26,857	13,459	40,316*	77,810*	

Imports were converted to round (live) weight by using these conversion factors:
1.00 whole; 4.50 meat; and 4.64 canned.

*Record.

are becoming less of a rarity in the inland and west coast states. However, the New England and New York markets continue to provide the largest regional outlet -- a situation which is likely to persist in the future.

Marketing of lobster was affected to some degree over the past year by a decline in tourism associated with higher fuel prices and uncertain fuel availability. On the Maine coast in particular, this situation caused some concern with an apparent decline in demand in local restaurants and outlets.

Imports. Domestic production is not sufficient to supply the great demand for American lobster in the United States, and a substantial proportion of the lobster consumed here is imported from Canada (Table IV.B.14). In 1981, we imported the equivalent of 40.3 million pounds of live lobster in the form of fresh, frozen, canned, and prepared lobster meat from Canada. In 1978, our imports amounted to 69 percent of the Canadian production of live and whole frozen lobster, 64 percent of fresh and frozen meat production, and 32 percent of canned meat production. It is obvious from available information that a substantial portion of our lobster supply is of Canadian origin, and we import most of their lobster production. Most Canadian minimum size limitations and fishing season regulations assure enhanced marketability of lobsters in the U.S. In addition, seasonal import patterns suggest that Canadian producers make some effort to supply more lobster in periods when our domestic supplies are slack. Canada has chosen as a matter of national policy to encourage fishing as an alternative to unemployment for many in the Maritimes, and thus offers a number of incentives to fishermen, such as low cost fuel and low interest loans, unemployment insurance, training and skills improvement programs, and sales tax exemptions which are not generally available to U.S. fishermen. With recent sharp increases in domestic fuel prices, U.S. fishermen currently pay about twice as much for fuel as Canadian producers. Our fishermen argue that a subsidy is thus given to the imported product which should be offset by a countervailing duty.

Domestic wholesalers and dealers who handle Canadian product argue that the costs for transportation, packaging, shrinkage, and insurance equalize the price of U.S. and Canadian lobster at the point of delivery and that they need Canadian supply to provide a year-round market. The dealers also amortize their costs over a larger sales volume if they sell imported product.

Both arguments have their points, and the issue is far from resolution. It is likely that manipulation of lobster supplies during parts of the year contributes to fluctuations in ex-vessel price for domestic fishermen to their disadvantage. It is not clear whether this is a benefit to consumers of lobster, but if prevailing prices are lower than they would be in scarcity, the consumer may be better off.

Table IV.B.15: Canadian Lobster Supply to U.S. by Product Type
(In Thousands of Pounds)

Year	Live or Whole Frozen Lbs.	Fresh Cooked Meat		Canned Meat		Total		Percentage of Round Weight "Utilization"
		Lbs.	Round Weight Equivalent	Lbs.	Round Weight Equivalent	Lbs.	Round Weight Equivalent	
1970	16,538*	574	2,586	2,381	11,048	19,493	30,172	64.6
1971	16,104	1,731	7,790	2,292	10,635	20,127	34,529	58.4
1972	15,491	738	3,320	2,162	10,032	18,391	28,843	63.7
1973	15,529	574	2,584	1,650	7,656	17,753	25,769	68.8*
1974	14,250	741	3,336	1,593	7,392	16,584	24,978	66.3
1975	15,004	738	3,321	1,992	9,243	17,734	27,568	64.3
1976	14,908	949	4,268	2,146	9,957	18,003	29,133	61.7
1977	14,434	558	2,509	2,547	11,818	17,539	28,761	60.9
1978	12,202	948	4,266	2,295	10,648	15,445	27,116	56.9
1979	14,397	1,865	8,393	1,790	8,307	18,052	31,097	58.0
1980	12,053	2,322	10,450	2,090	9,698	16,465	32,201	51.1
1981	15,296	2,569*	11,561*	2,901*	13,461*	20,766*	40,318*	51.5

Source: Fisheries of the United States Annuals, 1970-1981.

*Record.

Recent expansion of Canadian marketing efforts in Europe is apparently reducing their dependence on and shipments to the U.S. market. For example, between 1977 and 1978 the proportion of total Canadian lobster exports destined for U.S. markets declined from 83 percent to 73 percent.

Other imports which serve as close substitutes for American lobster include tails and products derived from other crustacean species such as the South African rock lobster. Because the preponderance of American lobster is consumed freshly cooked and in the shell, these substitutes are not a major factor in the market for American lobster.

Exports. The U.S. has been a net importer of American lobster for many years. With imports constituting 45 to 50 percent of our total domestic supply, development of a significant export market may seem unlikely. With the cultivation of demand for lobster in European markets, lucrative markets may become available for U.S. suppliers. Recently, there is some evidence that U.S. production is marketed in Canada during periods when their fishery is closed or supply cannot meet demand. Only Canada and the U.S. can supply any quantities of American lobster. Canadian entrepreneurs have made significant progress in developing European markets.

The U.S. Department of Commerce in 1978 funded a comprehensive study of export and domestic market opportunity for underutilized fish and shellfish. In the study (Anon, 1978; "Combs Report") opportunities are examined on a country-by-country basis. While lobster is not considered an underutilized species, the study pointed out factors to be considered in entering foreign markets.

Aside from the low level of knowledge concerning market potentials, a number of other barriers inhibit developing an export market. It is difficult to identify possible distribution channels. In some cases, product acceptance and consumer awareness must be developed. With a product such as live lobster, expensive storage and transport arrangements may need to be considered. Duties, import restrictions, and a lack of knowledge of local customs and contacts are all serious barriers, particularly for smaller operators. Once developed, a market could easily be undercut by other suppliers who would not need to amortize development costs, and a significant investment might be lost.

Despite these problems, the industry has made some inroads to the market and expressed further interest in exploring the potential. Additional progress may be made in the next few years.

C. THE RECREATIONAL FISHERY

Information on the number of recreational lobster fishermen is available only for New Hampshire, Massachusetts, Rhode Island, Connecticut and New York -- states in which a license is required to fish lobsters for recreational purposes. Recreational fisheries are conducted with a number of techniques, which include traps and diving with SCUBA equipment. While diving for lobsters is prohibited in Maine and New Hampshire, it can be an important component of the fishery in other areas. In Maine, where a license is required to fish lobsters for any purpose, all licensed lobster fishermen are classified as "commercial". However, a number of those fishermen are known to

fish lobsters only for recreational purposes. Recreational lobster fishing occurs in New Jersey, but its importance is not known, since the state does not presently issue lobster licenses of any sort. It is unlikely that a recreational trap fishery of any magnitude exists beyond three miles from shore. Similarly, recreational fisheries in areas south of New Jersey are unlikely due to a low availability of lobsters in the near shore waters of the states concerned.

The five states for which recreational catch data are available reported a total of more than 12,000 licensed recreational lobster fishermen in 1976 and a total annual recreational take of from 300 to 500 thousand pounds in recent years. While some attempts to survey and quantify recreational fisheries have been made (Smith, 1977), economic information is generally not available for these fisheries, but the costs of entering and operating on a small scale would not be great. In his survey of the Connecticut recreational fishery, Smith determined that Connecticut recreational lobstermen harvested an average 42 pounds per year. The investment in gear and equipment was relatively small, and only a few hours per week were spent in fishing or support activity. Although the fishermen averaged about six years of involvement in lobstering, this was much less than the average 14 years for commercial fishermen. Recreational lobstermen tended to have relatively high incomes from their regular employment and to work in high status jobs or professions.

The significance of the recreational lobster fishery may be understated if, as is apparent, a large number of commercial fishermen actually fish only to a limited extent. Such fishermen may be fishing at least in part for recreation.

D. OTHER MANAGEMENT INSTITUTIONS AND PROGRAMS

International Fisheries Programs

The American lobster has never been directly managed under international agreement. Prior to enactment of the Magnuson Act, many fisheries outside the territorial waters of the United States (beyond 12 miles then) were managed under the auspices of the International Commission for Northwest Atlantic Fisheries (ICNAF). That organization established management policies and allocated harvests among member nations, but implementation and enforcement were left to the member nations. The American lobster, however, was declared a "creature of the continental shelf" and reserved solely for the domestic fishery. Foreign participants in the Northwest Atlantic fishery under ICNAF were prohibited from fishing directly for lobsters.

Federal Fishery Management Plans

Fisheries for groundfish (cod, haddock and yellowtail flounder), Atlantic herring, scallops, surf clams and ocean quahogs, squid, mackerel and butterfish are currently under regulation by other fishery management plans. Fishermen fishing for lobsters are subject to these other plans if their activities are likely to result in the harvest of any of these other species. Similarly, fishing for any of these other species may subject a fisherman to the provisions of this plan if his activities are likely to result in the harvest of lobsters.

State Fisheries Programs

Most of the fishery for American lobster in the United States occurs within state waters. Historically, each state has managed its lobster fishery independently from other states, although the need for comparable management programs has long been recognized. The major state lobster regulations include: license requirements, catch/effort reporting, gear regulations, and fishing activity regulations (Table IV.D.1). Restrictions on the taking of berried lobsters and the size of lobsters that can be taken are two types of regulations that are universally in force among the lobster-producing states, although the legal minimum size (carapace length) has yet to become completely uniform. The remaining regulations vary from state to state; although most states have some restrictions on the landing of lobster parts and meats and require some type of licensing.

Over the years, there have been attempts to coordinate management practices between the states through informal cooperative agreements, but they have met with only limited success. Since 1972, the lobster-producing states of Maine through North Carolina and the National Marine Fisheries Service have cooperated under the auspices of the NMFS State/Federal Fishery Management Program to provide a uniform approach to management of the lobster fishery. All participants in the agreement agreed to work toward implementation of common precepts that were developed under the program (Table IV.D.2). Prohibiting the taking of berried or scrubbed lobsters is the only precept that was uniformly adopted as of 1977. The present emphasis within the State/Federal program is to work as quickly as possible towards the minimum carapace length of 3-3/16 inches in order to have a uniform minimum size. At present, New Hampshire and New Jersey have yet to adopt 3-3/16 inches as a minimum size.

OCS Leasing

During the Summer of 1981, exploratory drilling for oil and gas began on Georges Bank. Other sections of Georges Bank are currently proposed to be leased under the Outer Continental Shelf Lands Act. A reference was made to the sensitivity of lobsters to heavy metal and oil contamination and to their habitat requirements in Section IV.A to the extent that oil exploration is extended into prime offshore lobster habitat in the areas of the outer continental shelf and slope, adverse impacts to the offshore lobsters population could result. Contamination and disturbance of lobster habitat in these offshore areas should be minimized to avoid potential loss of production from this valuable resource.

Marine Mammals and Endangered Species Acts

Numerous species of marine mammals occur in the Northwest Atlantic, although the definitive species composition is unknown. The most recent comprehensive survey in this region was done in 1979 by the Cetacean and Turtle Assessment Program (CeTap), at the University of Rhode Island, under contract to the Bureau of Land Management (BLM), Department of the Interior*.

* Annual Report for 1979. A characterization of marine mammals and turtles in the Mid- and North-Atlantic areas of the U.S. outer continental shelf. Contract #AA551-CT8-48.

Table IV.D.1: Lobster Regulations by State

	ME	NH	MA	RI	CT	NY	NJ	DE	MD	VA	NC
1. <u>License Requirements</u>											
no license required							X		X		X
required to fish lobster	X	X	X	X	X	X		X		X	
required to land lobster	X	X	X	X	X					X	
required to deal in lobster	X	X	X	X	X						
2. <u>Legal provisions for aquaculture enterprises</u>	X	X	X	X	X	X	X				
3. <u>Fishermen Classification</u>											
none							X		X	X	X
commercial	X	X	X	X	X	X		X			
non-commercial		X	X	X	X	X		X			
4. <u>Catch/Effort Reporting</u>											
not required							X		X	X	X
required annually	X	X	X		X	X		X			
requires daily record				X	X						
5. <u>Gear Regulations</u>											
none							X		X		
by license class:		X	X	X	X	X				X	
quantity allowed		X	X			X		X		X	
type allowed	X	X	X			X		X			
owner identification required	X	X	X	X	X	X		X			
escapement opening in catching device specified	X		X	X				X			X
6. <u>Fishing Activity Regulations</u>											
none											
by license class or method:			X	X		X		X			
number of licences			X								
catch quotas						X		X			
area	X	X	X			X					
season	X		X					X			
day or time of day	X	X	X	X	X			X			
landing of lobster meat regulated	X	X	X	X	X	X		X	X	X	X
landing of lobster parts regulated	X	X	X	X	X	X		X	X	X	X
landing of gravid female lobsters prohibited	X	X	X	X	X	X	X	X	X	X	X
landings of v-notched female lobsters prohibited	X										
landing of lobsters regulated											
by size (carapace length)	X	X	X	X	X	X	X	X	X	X	X
5 inches maximum allowed	X										
3 1/16 in. minimum all'd											
3 1/8 in. minimum all'd		X					X				
3 3/16 in. minimum all'd	X		X	X	X	X		X	X	X	X

Table IV.D.2: Lobster management precepts of the State-Federal Program, and their current status of implementation.

Precept	State												
	ME	NH	MA	CT	RI	NY	NJ	DE	MD	VA	NC		
1. A program shall be developed to effectively control fishing effort on the lobster resource.	D	NA	P	NA	NA	NA	NA	I	NA	NA	NA		
2. Reciprocal enforcement between States shall be effected	NA	I	I	I	I	I	NA	NA	NA	NA	NA		
3. All States shall establish a uniform minimum legal carapace length of 3-1/2 inches with no State less than 3-3/16 inch carapace length by January 1, 1976.	P	D	P	P	P	P	P	D	P	P	P		
4. Maximum size limit shall not be imposed on the lobster fishery.	D	I	I	I	I	I	I	I	I	I	I		
5. All States shall enact uniform laws prohibiting the possession of egg-bearing or scrubbed lobsters.	I	I	I	I	I	I	I	I	I	I	I		
6. All States shall enact uniform laws prohibiting the landing of lobster meat.	I	I	I	I	P	I	D	I	NA	I	I		
7. All States shall enact uniform laws prohibiting the notching of female lobsters.	NA	I	I	I	I	I	I	I	I	I	I		
8. All States shall enact uniform laws prohibiting the possession of detached tails, claws or parts of lobster.													
9. All lobster traps shall incorporate an escape vent of a size adequate to minimize retention of sublegal lobsters.	I	I	I	I	I	P	D	I	NA	NA	I		
10. All fishermen and primary dealers shall be licensed and shall be required to keep daily records of their activities on forms provided by the licensing agency.	I	D	I	NA	I	NA	NA	I	NA	NA	I		
	P	P	P	I	P	P	NA	P	NA	P	NA		

Legend:

- I Implemented
- P Partially Implemented. Regulations conforming to the intent of the precept are in effect but may be less restrictive than is required to fulfill the intent of the precept.
- D Defeated. Legislative proposals to implement the precept were defeated in the legislature or died in legislative committee
- NA No Action. Management agency has not attempted to implement the precept.

The following is a summary of some of the information gathered in that study, which covered the area from Cape Sable, Nova Scotia, to Cape Hatteras, North Carolina, from the coastline to 5 nautical miles seaward of the 1000 fathom (1.8 km) isobath.

The following table lists the 21 cetaceans and the 4 turtle species encountered in the survey, ordered from most to least frequently sighted. Also given are the study term's "estimated minimum population number" for the area, if calculated, and those species currently included under the Endangered Species Act. All information is preliminary.

Cetaceans and Turtles Found In Survey Area

<u>Scientific Name</u>	<u>Common Name</u>	<u>Est. Minimum Population No. in Study Area</u>	<u>Endangered</u>	<u>Threatened</u>
LARGE WHALES:				
<u>B. physalus</u>	fin whale	1,102	X	
<u>M. novaeangliae</u>	humpback whale	684	X	
<u>B. acutorostrata</u>	minke whale	162		
<u>P. catodon</u>	sperm whale	300	X	
<u>E. glacialis</u>	right whale	29	X	
<u>B. borealis</u>	sei whale	109	X	
<u>O. orca</u>	killer whale			
SMALL WHALES:				
<u>T. truncatus</u>	bottlenose dolphin	6,254		
<u>Globicephala</u> spp.	pilot whales	11,448		
<u>L. acutus</u>	Atl. white-sided dolphin	24,287		
<u>P. phocoena</u>	harbor porpoise	2,946		
<u>G. griseus</u>	grampus	10,220		
<u>D. delphis</u>	saddleback dolphin	17,606		
<u>Stenella</u> spp.	spotted dolphin	22,376		
<u>S. coeruleoalba</u>	striped dolphin	unk		
<u>L. albirostris</u>	white-beaked dolphin	unk		
<u>Z. cavirostris</u>	Cuvier's beaked dolphin	unk		
<u>S. longirostris</u>	spinner dolphin	unk		
<u>S. bredanensis</u>	rough-toothed dolphin	unk		
<u>D. leucas</u>	beluga	unk		
<u>Mesoplodon</u> spp.	beaked whales	unk		
TURTLES:				
<u>C. caretta</u>	loggerhead turtle	4,017		X
<u>D. coriacea</u>	leatherback turtle	636		X
<u>L. kemp</u>	Kemp's ridley turtle	unk		X
<u>C. mydas</u>	green turtle	unk		X

The study team concluded that "both large and small cetaceans are widely distributed throughout the study area in all four seasons," and grouped the 13 most commonly seen species into three categories, based on geographical distribution. The first group contains only the harbor porpoise, which is distributed only over the shelf and throughout the Gulf of Maine, Cape Cod, and Georges Bank, but probably not southwest of Nantucket. The second group contains the most frequently encountered baleen whales (fin, humpback, minke, and right whales) and the white-sided dolphin. These are found in the same areas as the harbor porpoise, and also occasionally over the shelf at least to Cape Hatteras or out to the shelf edge. The third group "shows a strong tendency for association with the shelf edge" and includes the grampus, striped, spotted, saddleback, and bottlenose dolphins, and the sperm and pilot whales.

Loggerhead turtles were found throughout the study area, but appear to migrate north to about Massachusetts in summer and south in winter. Leatherbacks appear to have a more northerly distribution. The study team hypothesized a "northward migration in the Gulf Stream with a southward return in continental shelf waters nearer to shore." Both species usually were found "over the shoreward half of the slope" and in less than 60 m. No live green or Kemp's ridley turtles were found, and the latter's population has been estimated at only about 500 adults (Carr and Mortimer, 1980). The study area may be important for sea turtle feeding or migrations, but the nesting areas for these species generally are in the South Atlantic and Gulf of Mexico.

Outside of the above, the only endangered species occurring in the northwest Atlantic is the shortnose sturgeon (Acipenser brevirostrum). The Council urges fishermen to report any incidental catches of this species to the NMFS Shortnose Sturgeon Recovery Program.

The ranges of the subject species of the Plan and the above marine mammals and endangered species overlap to a large degree, and there always exists a potential for an incidental kill. Except in unique situation (e.g., tuna-porpoise in the central Pacific), such accidental catches should have a negligible impact on marine mammal/endangered species abundances, and the Council does not believe that implementation of this Amendment will have any adverse impact upon these populations. As additional information on this subject becomes available, it will be integrated into future Amendments to this Plan.

V. ANALYSIS OF ALTERNATIVES AND ENVIRONMENTAL CONSEQUENCES OF PROPOSED ACTION

A. INTRODUCTION

Section V of this EIS is primarily devoted to determining the probable effects of the lobster management program, detailed in Section III, on the physical and human environment with specific reference to (1) the biological resource, §V.B., (2) the economics of the industry, §V.C., and (3) the social and cultural context of the fishery, §V.G. Also considered are regulatory impacts, §V.D., including management costs, and institutional/management impacts, §V.F. This section also provides information relevant to the specification of the principal management measures in the plan.

The resource analysis section has two parts. The first part examines the short-term effects of alternative specifications of the principal management measure in the plan, i.e., the minimum size (carapace length) standard. Although only two alternative specifications are considered by the Council (as explained in §III.B.), a third specification is analyzed to illustrate the biological effect of the measure. All three specifications are analyzed in relation to the measures regulating the possession/landing of lobster parts and meat. The second part examines some of the long-term resource effects of the management program, particularly in relation to yield-per-recruit and resource viability. The resource analysis section concludes with a summary of the implications of the overall management program for the achievement of the plan's objective.

The economic analysis section evaluates only the short-term effects of the overall management plan. It focuses primarily on the economic impacts of alternative specifications of the principal management measure, i.e., the carapace length standard, but also analyzes the impact of the measure regulating the possession/landing of lobster parts and meat. The economic analysis section concludes with a qualitative discussion of the economic implications of the other measures in the lobster management program that are not amenable to quantitative analysis. A technical appendix supporting the economic analysis is included as Appendix 1 to this EIS.

B. RESOURCE ANALYSIS OF THE MANAGEMENT PROGRAM

Short-Term Biological Analysis

The purpose of the short-term biological analysis is to examine the relative changes in expected lobster catch levels associated with the management program over the first two years of plan implementation. The specific management measures expected to impact catch levels concern the ultimate prohibition on the landing of detached lobster parts and the establishment of a uniform minimum size limit. Ideally, the best data for assessing these short-term impacts are recently acquired length-frequency information from landed catches. Maine is the only state where such data have been collected on a continuing basis; the latest information available is for 1981. Relatively recent length-frequency data, collected during the course of a special study (Halgren, 1976), are available from New Jersey and are judged to be the most appropriate information to describe relative catches among sub-legal lobster size categories. Although a number of studies have been conducted in other state's lobster fisheries where length-frequency data were

collected, the data are probably no longer current. Hence, for the majority of the states the historical catch data plus estimates of growth and mortality rates represent the available data base.

It is desirable to apportion impacts according to those associated with lobster fisheries from within state waters as distinct from those associated with fisheries in the FCZ. Accordingly, it is necessary that the historical landings data be divisible by the two jurisdictions. The most recent landings data in which such a distinction is made are for 1976. Hence, the biological analysis uses the 5-year base period 1972-1976. It may be seen in §V.C. that the economic analysis is based upon the expected 1984 landings as projected from 1981 catches.

Using length-frequency information, impacts upon the Maine lobster fishery associated with alternative candidate size limits are estimated using the Hancock method (Hancock, 1975). In the absence of current length-frequency data from landed catches, the analysis of lobster fisheries for all states other than Maine uses landings data by state over the base period 1972-1976 combined with estimates of growth and mortality. These data are incorporated in a fishery simulation approach to assess relative changes in expected catch that may result from implementation of three alternative uniform minimum size limits; 3-1/8 inches, 3-3/16 inches, or 3-1/4 inches (carapace length). By this approach, the impacts upon individual states' lobster fisheries reflect regulatory inconsistencies which presently exist between the states. The choice of 3-3/16 inches as a candidate uniform minimum size limit is consistent with the fact that it represents the current regulated size limit for most lobster producing states. But, 3-1/8 inches is currently the minimum size limit in two states, New Hampshire and New Jersey, and thus is considered as an option in a broad effort to achieve uniform regulations over the entire management unit. Finally, a minimum size limit of 3-1/4 inches is examined with the purpose of assessing overall impacts which may be associated with a uniform size limit which is larger than any which presently exist. Candidate minimum size limits larger than 3-1/4 inches are not examined because the quantitative short-term economic impact analysis (§V.C.), due to limitations of available data, can consider only a relatively modest range in alternative minimum size limitations yet still provide mathematically robust impact estimates.

The procedures used in this analysis typically incorporate three key assumptions; (1) the level of recruitment in any given state lobster fishery or fishing area is assumed to be constant, (2) current estimated or assumed fishing mortality rates will remain constant and, (3) lobsters are assumed to exhibit "knife-edge" recruitment (the choice of whether or not a lobster will be kept and landed is based upon a specific size rather than a range of sizes) at the respective minimum size limit.

The New Jersey inshore lobster fishery is specifically exempted from the third assumption for reasons to be discussed later. Moreover, "knife-edge" recruitment may not necessarily be assumed to apply to the Maine fishery in all cases. It has been observed that Maine lobster fishermen may typically grade trap catches by eye, checking only those lobsters with a lobster gauge which may be perceived to be near the minimum size limit and, in some cases, even rejecting those which are barely legal (J.C. Thomas, personal communication). The result of this behavior on the part of the lobstermen is that the length-frequencies of landed catches over the length interval 3-3/16 to 3-1/4 inches may show substantially fewer lobsters than would otherwise be expected if true "knife-edge" selection were applied (Thomas, 1973). As a

consequence, the Hancock analysis of first-year impacts to the Maine fishery associated with changing the minimum size to 3-1/8 inches or 3-1/4 inches from the current 3-3/16 inches was modified to the extent necessary to examine the alternatives; 1) any change in the minimum size will, in the first year, be accompanied with a change in fisherman behavior such that true "knife-edge" recruitment occurs, or 2) that fisherman's selection behavior will not change as a consequence of changes in the minimum size.

As a means of capturing the differential price structure of the various market size categories of lobsters, the economic impact analysis distinguishes lobsters that are smaller than 1.25 lb, live weight, from those that are larger. In the Maine landings, the smaller lobsters (comprising the greater bulk of the total in weight) are all those that are larger than the candidate minimum sizes but smaller than about 3-1/2 inches (90.05 mm). At the present 3-3/16 inch size limit, about 61% of current (1981) Maine landings are within the smaller size category.

First year impacts upon total lobster landings, by state, associated with alternative minimum size limits are shown in Table V.B.4. Estimates for Maine given in double parentheses are associated with the assumption that fisherman behavior described above will not change (ie., that a significant number of lobsters just over legal size will be thrown back to the ocean). The remaining values assume that the behavior of Maine fishermen will change such that true "knife-edge" selection will occur. If the minimum size limit were increased to 3-1/4 inches, total Maine landings in the first year of implementation could be expected to decrease about 4.9% ((16.1%)). Conversely, if the minimum size limit were decreased to 3-1/8 inches, then the first year landings would increase some 29.9% ((16.9%)). The rather substantial increase in first-year catches associated with a decrease of the minimum size to 3-1/8 inches may have a superficial attraction. However, besides exacerbating the potential for recruitment overfishing, reductions from the current minimum size limit would lead to long-term average reductions in resource productivity (see Long-Term Biological Analysis).

The relative impacts associated with increased size limits given in Table V.B.4 represent maximum estimates which may be substantially reduced depending upon the time of the year the measure is implemented. The pattern of growth in individual lobsters is discontinuous due to molting, lobster populations typically exhibit one or more discrete molting seasons over a years time. Viewed on an annual basis, in many respects it makes little difference whether the annual increment of growth is spread over the entire year or whether it occurs all at once. The results from the dynamic modeling used in this analysis, when applied to the biological year, would be the same in either case. The molting period for inshore domestic populations of American lobsters during the summer and early autumn signals the beginning of the biological year. The results of the analysis, however, may be significantly different when applied to the calendar year. All of the candidate minimum carapace lengths being considered, where they involve increases in the existing size limits, may be easily exceeded in a single molt by lobsters which become sub-legal as a result of such increases. This means that the anticipated short-term losses to the harvesting sector associated with increased size limits will be felt only over the time between plan implementation and the next molting period. This implies that any regulated increase in the size limit which has been considered in this document, if implemented immediately prior to the molting period, may be expected to result

in substantially lower short-term impacts than have been estimated; the anticipated short-term impacts presented in this document are worst case estimates.

The schedule of implementation of the management provisions of the Lobster FMP are assumed to imply that the minimum size for the New Jersey fishery will remain at 3-1/8 inches until January 1, 1985 (then becoming 3-3/16 inches), but that current catch levels of sub-legal lobster parts will be effectively prohibited beginning in 1984. Hence, total impacts upon the New Jersey fishery will be spread over two years (loss of the sub-legal parts fishery in 1984 and an increase in the minimum size in 1985).

In an investigation of the New Jersey lobster fishery, Halgren (1975) reported that the practice of landing detached lobster tails and claws, particularly as that relates to lobsters smaller than the current minimum size limit (3-1/8 inches), has become more prevalent in recent years in the New Jersey fishery. Halgren (1976) provides length-frequency sample data from landed catches in the coastal fishery documenting the practice, as well as data describing the entire size distribution appearing in the corresponding trap catches. Assuming constant recruitment and constant fishing mortality rates, these data were examined using cohort analysis to estimate the partial fishing mortality rates by age class that result from current fishing practices; ages were inferred from the growth equation by Halgren (1976). Results were then applied to simulations of the New Jersey fishery.

It may be impossible to obtain reliable data on landings of lobster tails and claws from the coastal fishery in New Jersey and the extent to which those landings are reflected in reported catches. In an effort to define reasonable bounds to what may be the actual composition of New Jersey reported landings, two alternative assumptions were made in preliminary analyses of the New Jersey fishery:.

- (1) All reported landings in the coastal fishery are whole, live, legal sized lobsters implying that partial Fs estimated for sub-legal age classes are manifested in entirely unreported landings of lobster tails and claws, or conversely,
- (2) 50% of all reported landings in the coastal fishery are comprised of lobster parts (tails and claws) implying that a substantial fraction of the partial Fs for sub-legal age classes are accounted for by the reported landings.

By assumption (2), the apparent level of recruitment necessary to support the fishery is substantially lower than in case (1). Because of this fact, the expected relative impacts upon the total New Jersey fishery corresponding to the two alternatives differ by less than 1%. Therefore, the final form of the analysis assumes alternative (1); all reported landings are whole, legal sized lobsters. Moreover, detached lobster tails and claws are assumed to be derived exclusively from sub-legal lobsters.

There are no available data to suggest that significant lobster tail and claw "snapping" occurs in the New Jersey offshore fishery in the vicinity of Hudson Canyon. Therefore, in that segment of the total New Jersey lobster fishery "knife-edge" recruitment is assumed to occur at the 3-1/8 inch minimum carapace length.

New Jersey coastal lobsters recruit to the legal size range late in their fourth year of life, but because of the practice of landing detached lobster parts, they actually become vulnerable to fishing during their third year. In the area of Raritan Bay and the environs of Ambrose Light approaching the Greater New York harbor (the "Ambrose" fishery), fishing mortality rates (F) for fully vulnerable lobsters larger than the 3-1/8 inch minimum size limit have been estimated to be about $F=2.0$ (Andrews, 1980). With strict enforcement of the current minimum size limit, the partial F for age 4 lobsters would only be about $F=0.2$, in fact it appears to be about $F=1.6$. The partial F for age 3 lobsters in the "Ambrose" fishery has been estimated as $F=0.3$ entirely as a result of the landing of lobster parts.

In the balance of the New Jersey coastal fishery, which is principally centered in the most shoalward extension of Hudson Canyon ("mud hole") south to Pt. Pleasant and 0-25 miles from shore (the "Alongshore" fishery), fishing mortality rates for fully vulnerable lobsters larger than the minimum size are about $F=1.5$ (Andrews, 1980). Again, with strict enforcement of the minimum size limit, the partial F for age 4 lobsters would only be about $F=0.1$, but is instead about $F=1.0$ while that for age 3 lobsters is about $F=0.05$. In general, it appears that in the New Jersey coastal lobster fishery (particularly the "Ambrose" fishery) lobsters, which would become legal sized (ie., 3-1/8 inches) with one additional molt, are under heavy exploitation most probably for the tail and claw market.

Andrews (1980) provided reported landings by fishing area for 1979 indicating that the "Ambrose" fishery accounted for 69% of the total reported New Jersey landings, 16% were from the "Alongshore" fishery, and the balance (15%) was taken in the area of Hudson Canyon. The same relative proportions were applied to the mean total landings (about 1.07 million pounds) over the base period (1972-1976). A total legal catch (3-1/8 inch minimum size) of about 738,000 pounds is assumed to have been taken in the "Ambrose" fishery, 169,000 pounds in the "Alongshore" fishery, and some 165,000 pounds from the offshore canyons. Equilibrium recruitment levels have been scaled to provide such catches at the indicated fishing mortality rates (natural mortality rates are assumed to be $M=0.15$ in the coastal fisheries and $M=0.10$ in the offshore canyon fishery).

Results of the analysis indicate that New Jersey landings of detached tails and claws may be very substantial. With a total reported catch of 1.07 million pounds, some 1.37 million pounds of sub-legal lobsters (live weight) may be taken for the tail and claw market, 91% of which (1.25 million pounds) may be taken in the "Ambrose" fishery. Clearly, however, these estimates of the sub-legal lobster catch do not represent the landed catch since the body portion of the animal is discarded at sea. Using conversion factors specifying that one-half of the whole, live weight of a lobster is represented by the weight of the tail, and that the claws comprise one-third of the live weight, then the estimated total landed catch in the New Jersey lobster tail and claw market (product weight) may average about 680,000 pounds of lobster tails, and about 450,000 pounds of lobster claws. In terms of landed product weight, the loss of some 1.13 million pounds of tails and claws implies a 51.5% loss to the total New Jersey lobster fishery given strict enforcement of the current 3-1/8 inch size limit.

It must be emphasized that the above estimates were derived using several assumptions regarding 1) the fishing mortality rates in the various components of the fishery (Andrews, 1980), 2) the basis for estimating partial fishing mortality rates for sub-legal size lobsters (Halgren, 1976), and 3) the composition of the reported landings. The third assumption is undocumented. By that assumption, the reported landings are assumed to be whole live, legal sized lobsters and that all landings of tails and claws are from sub-legal sized lobsters. Hence these estimates of tail and claw product weight represent "worse case" estimates.

Commencing in 1985, a uniform minimum size limit for all U.S. American lobster fisheries is scheduled for implementation. The alternative uniform minimum sizes which are considered are 3-1/8 inches, 3-3/16 inches and 3-1/4 inches, carapace length. Assuming that, beginning in 1984, the sub-legal parts fishery had been entirely eliminated, then the projected relative short-term impacts, by state, associated with alternative candidate minimum size limits (relative to the respective existing size limit) are shown in Table V.B.4. Overall, the anticipated impacts upon landings in weight in the total U.S. fishery for American lobster during the first year of implementation of alternative uniform minimum size limits, are seen in the following tabulation.

<u>Uniform Minimum Size</u> (inches)	<u>Percent Change From Current Landings</u> (in first year of implementation)
3-1/8	+26.96 [+19.68]
3-3/16	+2.61
3-1/4	-5.61 [-11.87]

It should be emphasized that these overall impacts are derived from changes to alternative uniform minimum sizes after elimination of the fishery for sub-legal lobster parts in New Jersey coastal waters. As indicated above, elimination of the parts fishery beginning January 1, 1984, a loss of some 1.14 million pounds of tails and claws, represents a 51.5% loss to the total New Jersey landings. That initial loss, however, is more than made up in 1985 with continuation of the 3-1/8 inch minimum size; with a 3-3/16 inch minimum size in 1985, about 78% of the initial loss in weight of tails and claws will be recovered.

Numbers in brackets incorporate the assumption that Maine fishermen would not change their culling practices with changes in the minimum size limit. Intuitively, it may appear that Maine fishermen would be willing to expend the necessary extra time which may be required to measure all lobsters which are at a size near the minimum limit if, by such action, short-term losses could be minimized. However, the extent to which current behavior patterns may be modified in such a manner may strongly depend upon local availability of larger size classes of lobsters, as well as any number of other factors which are largely unquantifiable. For these reasons, the ranges in estimates are presented, but with the final rejoinder that the less severe impact associated with the 3-1/4 inch option is probably the closer to the reasonable expectation.

Table V.B.1: Percentage Distribution of Mean Annual Lobster Landings
Within and Between Resource Areas - Base Period was 1972-1976

	MEAN ANNUAL LANDINGS (pounds)	PERCENT OF AREA TOTAL	PERCENT OF GRAND TOTAL
<u>AREA 1. (Gulf of Maine Inshore)</u>			
Maine	17,153,360	81.52	56.19
New Hampshire	525,420	2.50	1.72
Massachusetts (north)	3,363,294	15.98	11.02
AREA TOTAL	21,042,074	100.00	68.93
<u>AREA 2. (Southern New England / Middle Atlantic Inshore)</u>			
Massachusetts (south)	1,045,096	32.56	3.42
Rhode Island	762,200	23.75	2.50
Connecticut	560,920	17.48	1.84
New York	462,280	14.40	1.51
New Jersey	366,520	11.42	1.20
DELMARVA	12,340	0.38	0.04
AREA TOTAL	3,209,356	100.00	10.51
<u>AREA 3. (Georges Bank and South Offshore)</u>			
Massachusetts	2,275,760	36.26	7.45
Rhode Island	2,568,000	40.91	8.41
New York	343,760	5.48	1.13
New Jersey	705,200	11.24	2.31
DELMARVA	384,000	6.12	1.26
AREA TOTAL	6,276,720	100.00	20.56
GRAND TOTAL	30,528,150		100.00

Sources: Fishery Statistics of the U.S., 1972-1976. Inshore Massachusetts landings data from C. Kellogg, Mass. Div. Mar. Fish.

Table V.B.2: Assumed Instantaneous Fishing Mortality Rates In
U.S. Lobster (Homarus americanus) Fisheries
For The Long-Term Biological Analysis

<u>FISHERY</u>	<u>FISHING MORTALITY RATE</u>
<u>Coastal Fisheries</u>	
Maine	2.303
New Hampshire	2.303
Massachusetts	
North of Cape Cod	2.303
South of Cape Cod	2.00
Rhode Island	2.00
Connecticut	2.00
New York	2.00
New Jersey	
"Ambrose" fishery	2.00
"Alongshore" fishery	1.51
DELMARVA	1.51
<u>Offshore Fisheries</u>	
Massachusetts (Georges Bank)	1.00
Rhode Island (Georges Bank & South)	1.00
New York (Hudson Canyon & East)	1.00
New Jersey (Hudson Canyon)	1.00
DELMARVA	1.00

Sources: Andrews (1980), Briggs (1980), Russell et al (1978), Smith (1977),
Thomas (1973), van Engel et al (1979).

Table V.B.3: New Jersey Inshore Lobster Fishery Simulation
For The "Ambrose" Fishery

	MINIMUM SIZE (inches)	AGE (yrs)	CARAPACE LENGTH (mm)	AVERAGE WEIGHT (gm)	FISHING MORTALITY (F)	ESTIMATED STOCK (millions)
S		3	48.97	207	0.254	4.739
M		4	65.79	333	1.606	3.164
A	3-1/8	4.912	79.38	426 ^{1/}	0.176 ^{2/}	
L		5	80.61	549	2.000	0.547
L	3-3/16	5.026	80.96	552 ^{1/}	1.948 ^{2/}	
(1.25 lb)	3-1/4	5.141	82.55	566 ^{1/}	1.718 ^{2/}	
(1.25 lb)-----		5.574	88.30	-----		
L		6	93.65	802	2.000	0.064
A		7	105.14	1080	2.000	0.007
R		8	115.26	1370	2.000	0.001
G		9	124.18	1665	2.000	0.0001
E						
(1.25 lb)						

Lobster growth (both sexes) was assumed to conform to the growth equation:

$$L_t = 190 [1 - e^{-0.127(t-0.653)}]$$

Length-weight relationship:

$$W_t = 0.001365 L_t^{2.88726}$$

Natural Mortality Rate, $M=0.15$.

1/ Alternative mean weights at capture of age 4 and 5 lobsters corresponding to alternative minimum size limits.

2/ Alternative fishing mortality rates applicable to age 4 and 5 lobsters corresponding to alternative minimum size limits.

Table V.B.4: Expected Percent Changes in Lobster Catches in 1985 With Implementation of Alternative Size Limits on January 1, 1985 Relative to Expected 1985 Catch Levels at Current Size Limits

<u>STATE</u>	<u>ALTERNATIVE MINIMUM SIZE (INCHES)</u>		
	<u>3-1/8</u>	<u>3-3/16</u>	<u>3-1/4</u>
Maine ^{1/}	+29.89 [+16.93]	0.0 0.0	-4.93 [-16.07] ^{2/}
New Hampshire	0.0	-17.10	-45.05
Massachusetts	+15.13	0.0	-16.41
Rhode Island	+11.17	0.0	-5.59
Connecticut	+34.09	0.0	-6.26
New York	+21.41	0.0	-5.89
New Jersey ^{3/}	+125.68	+82.73	+69.48
DELMARVA	+2.07	0.0	-2.26
<u>TOTAL</u>	+26.96 [+19.68]	+2.61 +2.61	-5.61 [-11.87] ^{4/}

- ^{1/} Impacts to the Maine fishery estimated by "Hancock" method using current length-frequency data from landed catches. Impacts to all other states estimated by simulation approach (see text page 74).
- ^{2/} Estimated impacts associated with the assumption that the behavior of Maine fishermen would not change; that they would continue to throw back a proportion of barely legal lobsters. See text page 74.
- ^{3/} Impacts to New Jersey landings are relative to expected landings with the current 3-1/8 inch size limit after elimination of the sub-legal lobster parts fishery.
- ^{4/} Total impacts incorporating the assumption that Maine fishermen's behavior regarding culling practices would not change. The first corresponding estimates reflect the assumption that Maine fishermen would cull exactly to the lobster gauge, thus generate "knife-edge" selection.

Long-Term Biological Analysis

This segment of the biological analysis utilizes the yield per recruit characteristics of the major American lobster resource components described in section IV.A. of this document to evaluate the interaction between the age at which lobsters first appear in the landed catch (ie., minimum size) and the rate at which they are fished in relation to the implications for long-term average resource productivity. The analysis focuses upon three resource components; coastal Gulf of Maine, coastal Southern New England / Middle Atlantic, and the offshore areas of Georges Bank and south on the continental shelf and slope.

Coastal Gulf of Maine. The major production area in the U.S. fishery for American lobster has historically been the coastal waters of the Gulf of Maine. The economic importance of the fishery to the area has long been the stimulus for scientific investigation of the resource with the result that many aspects of lobster biology are fairly well understood. The results from some of these investigations have revealed migratory activity by adult lobsters along the coast, particularly in the western Gulf of Maine (Dow, 1974; Krouse, 1977; Morrissey, 1971). As a consequence of the apparent dynamic intermixture of lobster populations of the coastal waters of the Gulf of Maine it has been assumed that uniform growth and mortality rates are applicable to the entire area. Estimates of these biological parameters by Thomas (1973) were used in the analysis.

Using the growth equation and length-weight relationship developed by Thomas (1973) and his estimates of fishing (F) and natural (M) mortality rates, values for yield per recruit (Y/R) over a range of F s and ages at first capture (expressed as minimum size limits) have been generated after the method by Paulik and Gales (1964). To express the results in terms of relative changes from current conditions in the entire fishery it is necessary to account for the fact that New Hampshire presently has a minimum size limit of 3-1/8 inches while Maine and Massachusetts enforce a 3-3/16 inch size limit. Hence, knife-edge recruitment to the overall fishery is assumed to occur at a weighted average size limit slightly less than 3-3/16 inches calculated on the basis of the estimated mean recruitment levels which were generated in the Short-Term Biological Analysis.

The results of the long-term analysis in terms of expected relative changes from current conditions are shown in Table V.B.5. and depicted in Figure V.B.1. Over the range of alternative candidate size limits considered, Y/R may be increased as much as 40% if the fishing mortality rate were reduced to the level of F_{max} . However, such a change would require a reduction of effective fishing effort by more than 90%. The same relative increase in Y/R could be achieved through increasing the minimum size limit to 4 inches without adjustment of the fishing mortality rate. Indeed, it is possible to increase Y/R as much as 80% through increases in the size limit without addressing F .

To achieve more technically modest goals for lobster management it is seen that a 5% gain in Y/R may be expected from either increasing the size limit to 3-1/4 inches without addressing F , or by reducing F about 45% with a uniform 3-3/16 inch size limit. In either case the long-term average total annual yield may be expected to increase some 1 million pounds. However, in consideration of the management objective as it relates to the prevention of

recruitment overfishing, it may be more appropriate to increase the minimum size limit; with a 3-1/4 inch minimum size the relative number of female lobsters that may be expected to become berried before they become subject to fishing may approximately double. With a larger brood stock, the likelihood of incurring recruitment overfishing, in the absence of controls on effort, should abate while stronger, more stable recruitment may ensue.

Coastal Southern New England / Middle Atlantic. The only states which currently possess lobster minimum size limits less than 3-3/16 inches are New Hampshire and New Jersey, but, as discussed in the Short-Term Biological Analysis, New Jersey may be further differentiated on the basis of fishing practices. Therefore, in view of the fact that changes in those fishing practices may result in significant impacts on the New Jersey lobster industry, that state's fishery will be examined separately.

Over the entire resource area a number of recent scientific investigations (Briggs, 1980; Halgren, 1976; Russell et al, 1978; Smith, 1977; Morrissey [ed.], 1976) have indicated similar growth and mortality characteristics among the coastal lobster populations. Hence, the analysis assumes a common growth equation and fishing and natural mortality rates for the entire area with the exception of the New Jersey fishery and the inshore DELMARVA fishery. The latter was assumed to have growth and mortality characteristics identical to the New Jersey "Alongshore" fishery. As in the case of the coastal Gulf of Maine, there is evidence that significant seasonal migratory activity occurs such that considerable homogeneity between populations may be expected. In the case of the New Jersey fishery, the Short-Term Biological Analysis demonstrated the extraordinary scale of expected impacts associated with candidate management measures such that an evaluation of the expected long-term implications of those measures ought to be accomplished using the locally derived biological parameters.

The expected relative changes in yield per recruit (derived after the method of Paulik and Gales, 1964) for coastal lobster fisheries south of Cape Cod, except that for New Jersey (see below), are shown in Table V.B.6. and illustrated in Figures V.B.2.(A). and V.B.3. Because of the substantially smaller size attainable by lobsters in this area relative to those in the Gulf of Maine (and despite a faster growth rate) the maximum possible long-term gain in Y/R associated with increased size limits without controls on effective effort is about 33% (with a minimum size limit of about 4-1/2 inches). In the Gulf of Maine it was seen that the comparable gain was 80%. Among the alternative candidate size limits considered, Y/R may be increased as much as 14% with reduction of the fishing mortality rate by 85% to the level of F_{max} . A 5% gain in Y/R may be accomplished with a 3-1/4 inch size limit combined with a reduction of the fishing mortality rate of about 45%. These results indicate that significant gains in long-term average resource productivity are attainable in the area considered but that to accomplish these gains more restrictive management may be required for value received than is the case in the Gulf of Maine.

An increase in the minimum size limit to 3-1/4 inches without addressing the fishing mortality rate, although resulting in only a marginal benefit in terms of Y/R (+1.4%), could be expected to at least double the number of female lobsters which may become berried before they become vulnerable to fishing. This expectation may result in an increased spawning stock with

attendant reduction of the risk of recruitment overfishing. Conversely, reduction of the minimum size limit to 3-1/8 inches would be expected to result not only in a reduction in Y/R but also reduce the number of berried females and thus exacerbate that risk.

The long-term analysis of the coastal New Jersey lobster fishery utilizes the locally derived growth equation by Halgren (1976);

$$L_t = 190 [1 - e^{-0.127(t-0.653)}]$$

plus the length-weight relationship assumed for the entire coastal lobster fishery south of Cape Cod;

$$W_t = 0.001365 L_t^{2.88726}$$

and a natural mortality rate, $M=0.15$, (common to the entire area as well) to calculate values for Y/R after the method of Paulik and Gales (1964).

The results of the analysis of the New Jersey fishery in terms of changes in Y/R relative to the current level are given in Table V.B.7. and illustrated in Figures V.B.2.(B). and V.B.3. Even without addressing the fishing mortality rate, the fact that gains in Y/R ranging from 53% to 62% may be achieved with compliance with any of the three alternative candidate size limits demonstrates that the potential productivity of the resource is not being realized with current fishing practices. The results of this analysis indicate a maximum potential gain in Y/R greater than 150%, associated with a minimum size of about 5 inches, while maintaining F_s at the current levels. With simultaneous compliance with any of the alternative candidate size limits and reduction of fishing mortality to F_{max} , Y/R could be increased some 100% relative to current levels.

Given the assumptions discussed in conjunction with the Short-Term Biological Analysis, it was estimated that the average size at first capture in the "Ambrose" fishery is currently less than 2-1/2 inches, carapace length. In the discussion on Size at Maturity (§IV.A.) it was seen that the smallest female lobster observed to be carrying eggs in New Jersey waters was 79 millimeters (3-1/8 inches), carapace length. This implies that native berried female lobsters endemic to New Jersey coastal waters, particularly in the area of the "Ambrose" fishery, must first survive approximately one year of vulnerability to fishing before they first have the opportunity to reproduce. In view of the high fishing mortality rates extant, it seems likely that much of the reproductive activity in support of the "Ambrose" fishery may be currently dependent upon immigrants from other areas. If such is the case, then the continued existence of the fishery, as it is currently practiced, may be dependent upon unknown exogenous factors, making it inherently unstable.

Offshore Georges Bank and South. Lobster populations on the continental shelf and slope from Georges Bank to Virginia have received attention in a number of investigations examining growth and mortality (Andrews, 1980; Burns et al, 1979; Cooper and Uzmann, 1977; Russell et al, 1978; van Engel et al, 1979), and movements and migrations (Andrews, 1980; Fogarty, 1980; Lund et al, 1973; Morrissey, 1971; Russell et al, 1978; Uzmann et al, 1977; van Engel et al, 1979). On the basis of this work it is clear that very substantial seasonal migrations occur among offshore lobster populations with intermixture

between adjacent areas such that relatively uniform rates of growth and mortality may be assumed to occur with the possible exception of the more remote regions of eastern Georges Bank where fishing mortality rates may be lower than in the more heavily fished areas such as off Southern New England.

Burns et al, (1979) note that the fishing mortality rate in the Southern New England offshore fishery in 1971 was estimated to be $F=0.67$ while van Engel et al (1979) reported an estimate of $F=1.43$ in offshore Virginia waters. Andrews (1980) estimated total mortalities for males ($Z=0.93$) and females ($Z=1.07$) in the area of Hudson Canyon. On the basis of these studies, this analysis assumes a uniform fishing mortality rate of $F=1.0$ for both sexes with natural mortality, $M=0.1$.

Relative changes in yield per recruit (calculated after the method of Paulik and Gales, 1964) which may be associated with changes in the fishing mortality rate and age at first capture for offshore lobsters have been estimated using growth equations developed by Cooper and Uzmann (1977) and length-weight relationships reported by Burns et al (1979). Offshore lobsters exhibit very significant differences in growth characteristics by sex. This is not to say that offshore populations of American lobsters are uniquely different from their inshore counterparts. At the time that Cooper and Uzmann were conducting their study of the lobster populations in the offshore canyons on the edge of the continental shelf, fishing mortality rates had historically been relatively low as compared to the inshore lobster fisheries, thus a considerable reservoir of older age classes of lobsters were in existence. Hence, sex-related differences in growth characteristics, which become apparent only in the older age classes, could be observed.

Currently, there is no explicit regulation of the domestic lobster fishery in the FCZ. All lobster producing states, however, regulate lobster landings. Therefore, implicit regulation of lobster landings from the FCZ may be assumed to exist, but such regulation reflects many of the inconsistencies between the states' regulatory regimes. Among the states having participants in the offshore lobster fishery, all except New Jersey currently possess a 3-3/16 inch minimum size limitation. For the analysis of the offshore lobster fishery it has been assumed that offshore fishermen landing lobsters in New Jersey operated under a 3-1/8 inch minimum size limitation. As previously noted, there is no evidence that significant landing of sublegal sized lobsters (ie., less than 3-1/8 inch) occurs from the New Jersey offshore canyon fishery. Therefore, knife-edge recruitment to the overall offshore lobster fishery is assumed to occur at a weighted average size limit slightly less than 3-3/16 inches calculated on the basis of the estimated mean recruitment levels which were generated in the Short-Term Biological Analysis.

The results of the analysis of the offshore fishery in terms of changes in Y/R relative to the current level are given in Table V.B.8. and illustrated in Figures V.B.4. and V.B.5. It may be seen that the rapid rates of growth and large maximum sizes attainable among offshore lobsters allow very substantial potential gains in Y/R, particularly among the males. Thus, reduction of the fishing mortality rate to F_{max} while retaining the current minimum size limit could be expected to increase Y/R for male lobsters over 150% and nearly 60% for the females. Even greater potential gains may result from increasing the size limit; without addressing the fishing mortality rate, Y/R for males may be increased as much as 300% while that for females may be increased up to

120% but, minimum carapace lengths of 6-8 inches would be required. On a more modest scale, gains in Y/R of 20-45% may be obtained through 50% reductions in the fishing mortality rate and a carapace length of 3-1/4 inches. Of course, marginal gains in Y/R may be achieved by simply instituting a uniform minimum carapace length of 3-3/16 inches or 3-1/4 inches (0.1% and 3.7%, respectively) without addressing the fishing mortality rate.

The long-term average increases in resource productivity that have been estimated in this analysis, which may accrue as a result of increased size limits, or reduced fishing mortality rates, or a combination of both have uniformly assumed that no relationship exists between the size of the spawning stock and the level of recruitment that may be derived from reproductive activity of that stock. It seems inconceivable, however, that such a relationship does not exist. If such is the case, then this analysis may substantially underestimate the potential gains in long-term resource productivity through lobster management. Moreover, the demonstration of such a relationship would allow a comprehensive program, capable of assessing potential risks associated with alternative management proposals, as well as the potential benefits in terms of expected additional recruitment and the subsequent enhancement of total yield from the fishery.

Table V.B.5: Percent changes in yield per recruit (Y/R) for inshore Gulf of Maine lobsters associated with alternative ages at first capture (in terms of minimum size) and changes in fishing mortality (F) relative to current weighted average minimum size (3.186 inches) and current assumed $F=2.30$. Values of F shown in brackets.

PERCENT CHANGE IN Y/R AT MINIMUM SIZE					
PERCENT CHANGE IN F, (F rate)		3-1/8	CURRENT	3-3/16	3-1/4
+ 30.26	(3.0)	- 5.18	- 1.53	- 1.43	+ 3.69
+ 8.55	(2.5)	- 4.10	- 0.51	- 0.40	+ 4.27
0.00	(2.3)	- 3.56	0.00	+ 0.10	+ 4.60
- 13.16	(2.0)	- 2.54	+ 0.95	+ 1.06	+ 5.28
- 34.87	(1.5)	+ 0.01	+ 3.34	+ 3.42	+ 7.19
- 56.58	(1.0)	+ 4.88	+ 7.98	+ 8.05	+11.37
- 78.29	(0.5)	+17.51	+20.16	+20.22	+22.95
- 91.32	(0.2)	+36.44 ^{1/}	+38.16 ^{1/}	+38.21 ^{1/}	+39.93 ^{1/}

^{1/} Percent change in Y/R associated with F_{max} .

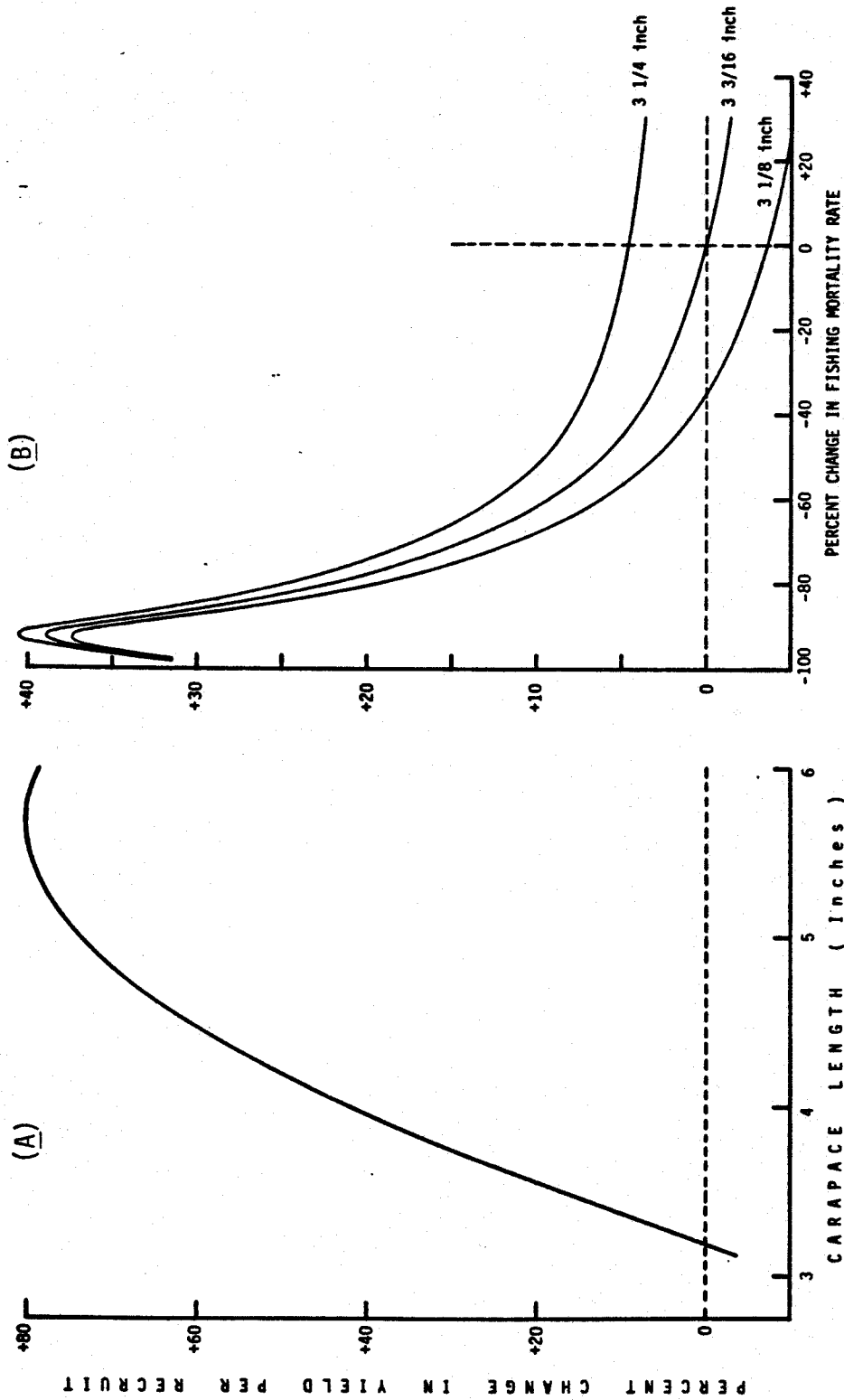


Figure V.B.1: Percent changes in coastal Gulf of Maine lobster yield per recruit associated with, (A) a wide range in minimum legal carapace lengths with fishing mortality rates held constant at current assumed levels, and (B) adjustment of the fishing mortality rate at alternative minimum legal carapace lengths, all relative to current conditions. The curve corresponding to the estimated current weighted average minimum legal carapace length (3.186 inches) is virtually identical to that for 3-3/16 inches and was omitted for clarity.

Table V.B.6: Percent changes in yield per recruit (Y/R) for inshore Southern New England and South (excepting inshore New Jersey) lobsters associated with alternative ages at first capture (in terms of minimum size) and changes in fishing mortality (F) relative to the current minimum size (3 3/16 inches) and current assumed F=2.0. Values of F shown in brackets.

		PERCENT CHANGE IN Y/R AT MINIMUM SIZE		
PERCENT CHANGE IN F, (F rate)		3-1/8	3-3/16	3-1/4
+ 50	(3.0)	- 5.69	- 0.52	+ 0.34
+ 25	(2.5)	- 4.94	- 0.43	+ 0.66
0	(2.0)	- 3.87	0.00	+ 1.36
- 25	(1.5)	- 2.12	+ 1.14	+ 2.76
- 50	(1.0)	+ 1.18	+ 3.86	+ 5.65
- 75	(0.5)	+ 8.28	+10.17	+11.72
- 85	(0.3)	+11.59 _{1/}	+12.86 _{1/}	+13.97 _{1/}

{1/} Percent change in Y/R associated with F{max}.

Table V.B.7: Percent changes in yield per recruit (Y/R) for inshore New Jersey lobsters associated with alternative ages at first capture (in terms of minimum size) and changes in fishing mortality(F) relative to current average effective minimum size (about 2.44 inches) and current assumed F=2.0. Values of F shown in brackets.

		PERCENT CHANGE IN Y/R AT MINIMUM SIZE			
PERCENT CHANGE IN F, (F rate)		CURRENT	3-1/8	3-3/16	3-1/4
+ 50	(3.0)	- 6.66	+49.19	+ 56.78	+ 59.04
+ 25	(2.5)	- 3.93	+50.84	+ 57.59	+ 60.19
0	(2.0)	0.00	+53.41	+ 59.40	+ 62.39
- 25	(1.5)	+ 6.36	+57.94	+ 63.23	+ 66.59
- 50	(1.0)	+18.52	+66.92	+ 71.51	+ 75.09
- 75	(0.5)	+47.48	+86.97	+ 90.44	+ 93.55
- 85	(0.3)	+68.56	+98.13 _{1/}	+100.62 _{1/}	+102.90 _{1/}
- 90	(0.2)	+77.28 _{1/}	+98.08	+ 99.72	+101.23

{1/} Percent change in Y/R associated with F{max}.

Note: All calculations were based upon whole live weights; actual yield changes will depend upon extent of fishing practice of detaching tails and claws.

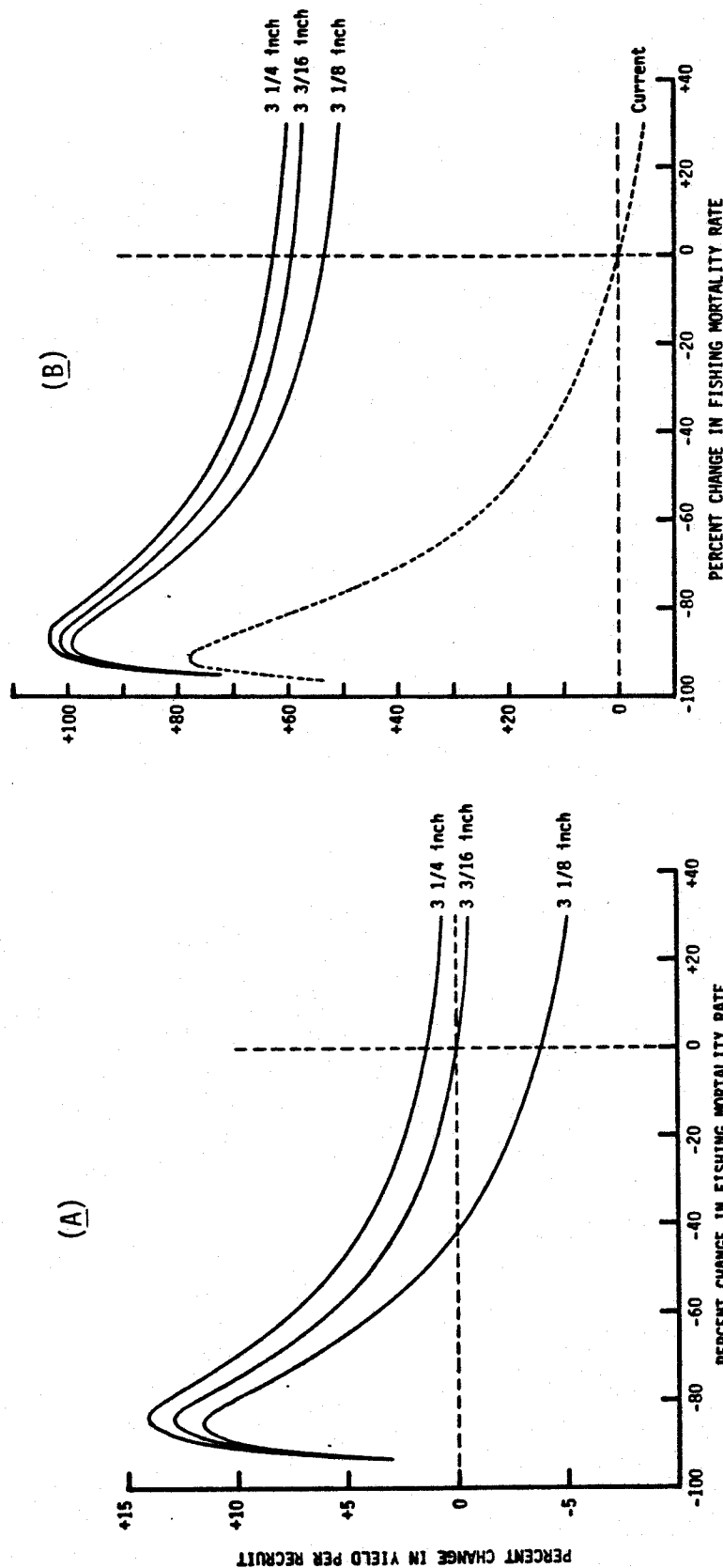


Figure V.B.2: Percent changes in coastal Southern New England/South lobster yield per recruit (A) for all areas except New Jersey, and (B) for New Jersey alone, associated with adjustments of fishing mortality rates at alternative minimum legal carapace lengths, all relative to current conditions. Particular notice is drawn to the dotted curve in (B) "Current" depicting the estimated relationship presently existing in consequence of fishing practices.

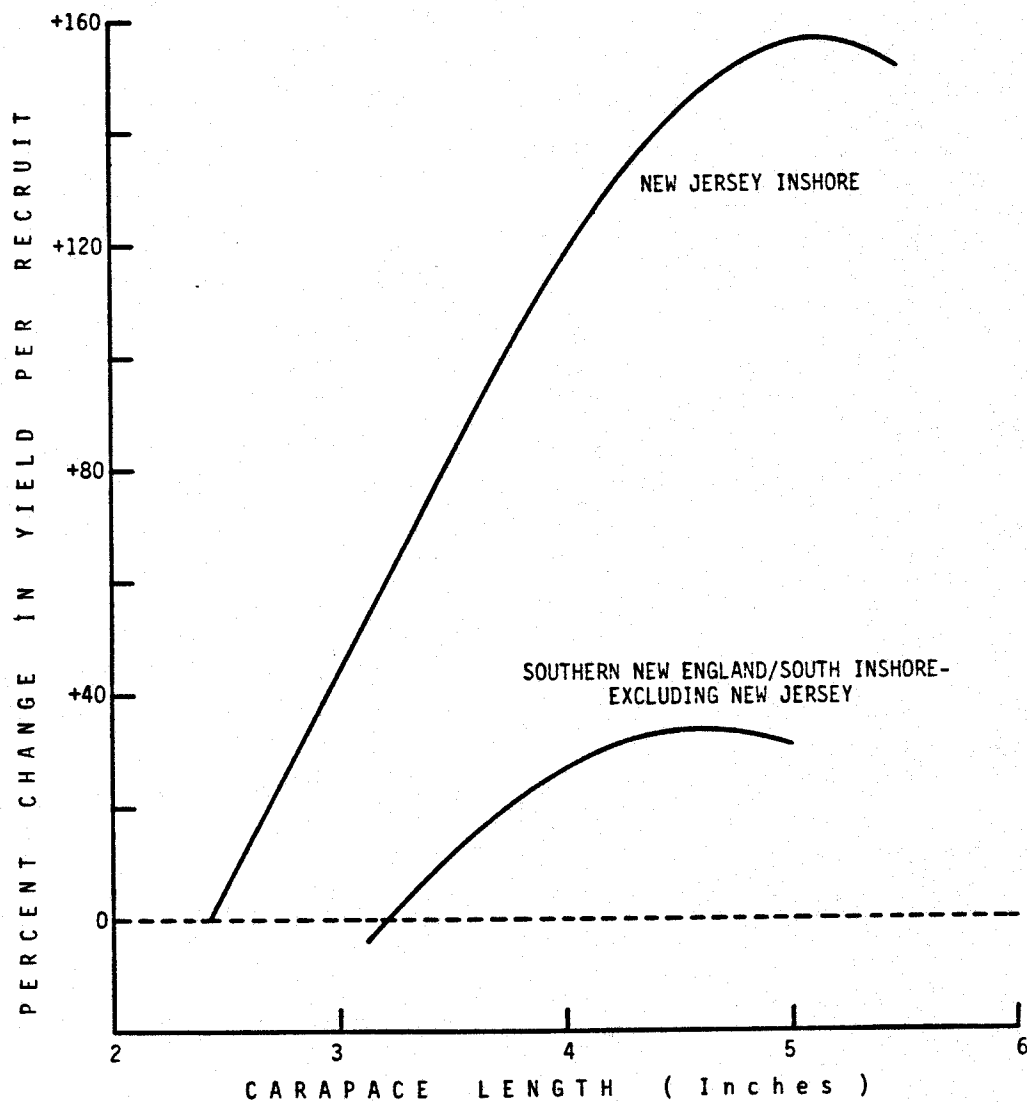


Figure V.B.3: Percent changes in coastal Southern New England/South lobster yield per recruit for all areas except New Jersey and for New Jersey alone associated with a wide range in minimum legal carapace lengths with fishing mortality rates held constant at current assumed levels, all relative to current conditions.

Table V.B.8: Percent changes in yield per recruit (Y/R) for offshore Georges Bank and South lobsters associated with alternative ages at first capture (in terms of minimum size) and changes in fishing mortality (F) relative to current weighted average minimum size (about 3.186 inches) and current assumed $F=1.0$. Values of F are shown in brackets.

		PERCENT CHANGE IN Y/R AT MINIMUM SIZE			
PERCENT CHANGE IN F, (F rate)		<u>3-1/8</u>	<u>CURRENT</u>	<u>3-3/16</u>	<u>3-1/4</u>
<u>MALES</u>					
+150	(2.5)	- 25.98	- 23.49	- 23.42	- 20.62
+100	(2.0)	- 22.85	- 20.08	- 20.01	- 16.94
+ 50	(1.5)	- 16.81	- 13.75	- 13.67	- 10.33
0	(1.0)	- 3.33	0.00	+ 0.13	+ 3.74
- 50	(0.5)	+ 38.02	+ 41.58	+ 41.68	+ 45.40
- 90	(0.1)	+153.17 _{1/}	+154.87 _{1/}	+154.92 _{1/}	+156.67 _{1/}
<u>FEMALES</u>					
+150	(2.5)	- 16.50	- 12.25	- 12.12	- 6.98
+100	(2.0)	- 14.29	- 10.30	- 10.18	- 5.61
+ 50	(1.5)	- 10.65	- 6.95	- 6.84	- 2.77
0	(1.0)	- 3.41	0.00	+ 0.10	+ 3.73
- 50	(0.5)	+ 16.36	+ 19.37	+ 19.46	+ 22.57
- 85	(0.15)	+ 56.41	+ 58.08	+ 58.13	+ 59.84 _{1/}
- 90	(0.1)	+ 57.23 _{1/}	+ 58.37 _{1/}	+ 58.40 _{1/}	+ 59.54

{1/} Percent change in Y/R associated with F{max} .

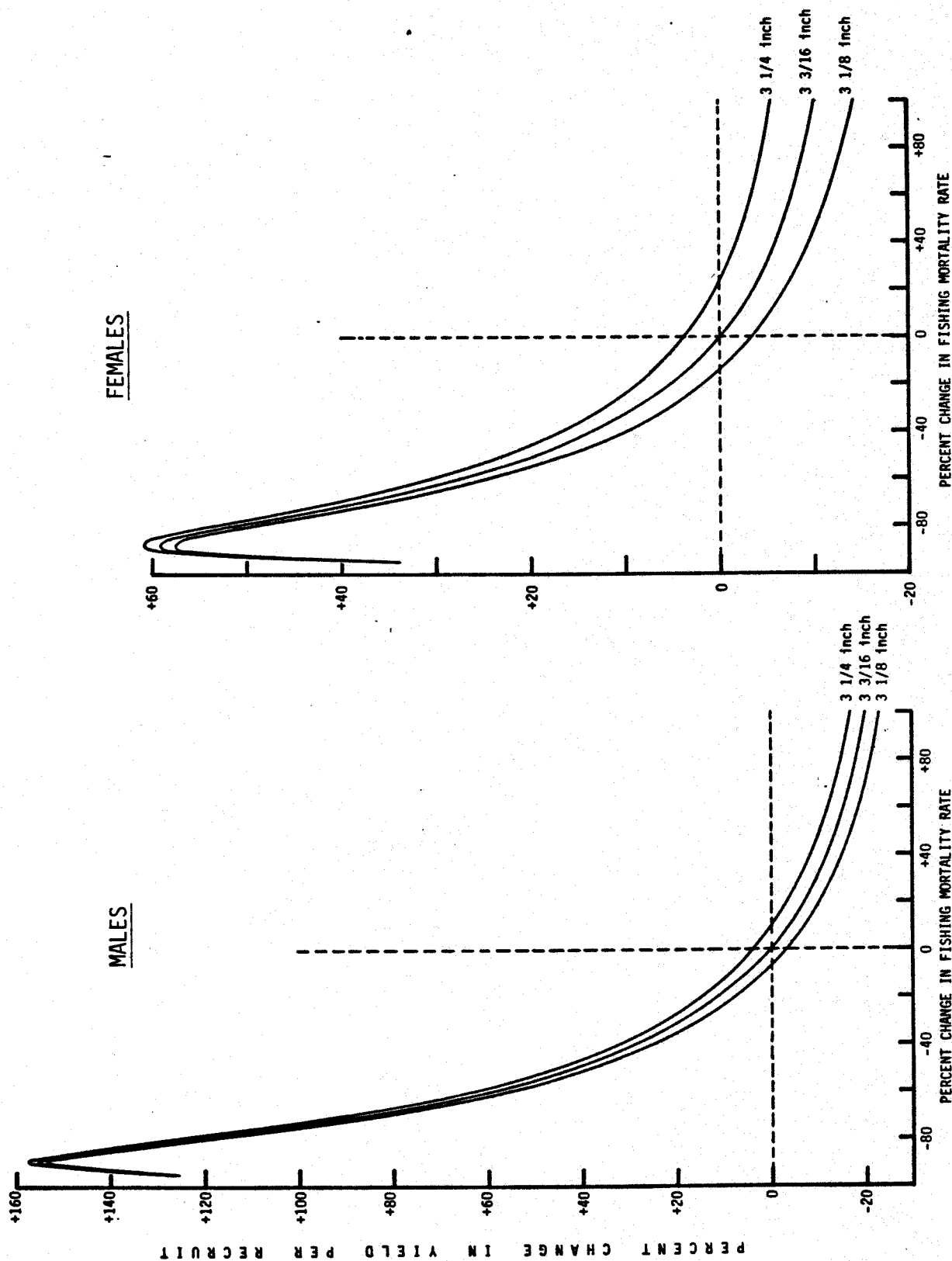


Figure V.B.4: Percent changes in offshore American lobster yield per recruit by sex associated with adjustments of fishing mortality rates at alternative minimum legal carapace lengths, all relative to current conditions. The curves corresponding to the estimated current weighted average minimum legal carapace length are virtually identical to that for 3-3/16 inches and were omitted for clarity.

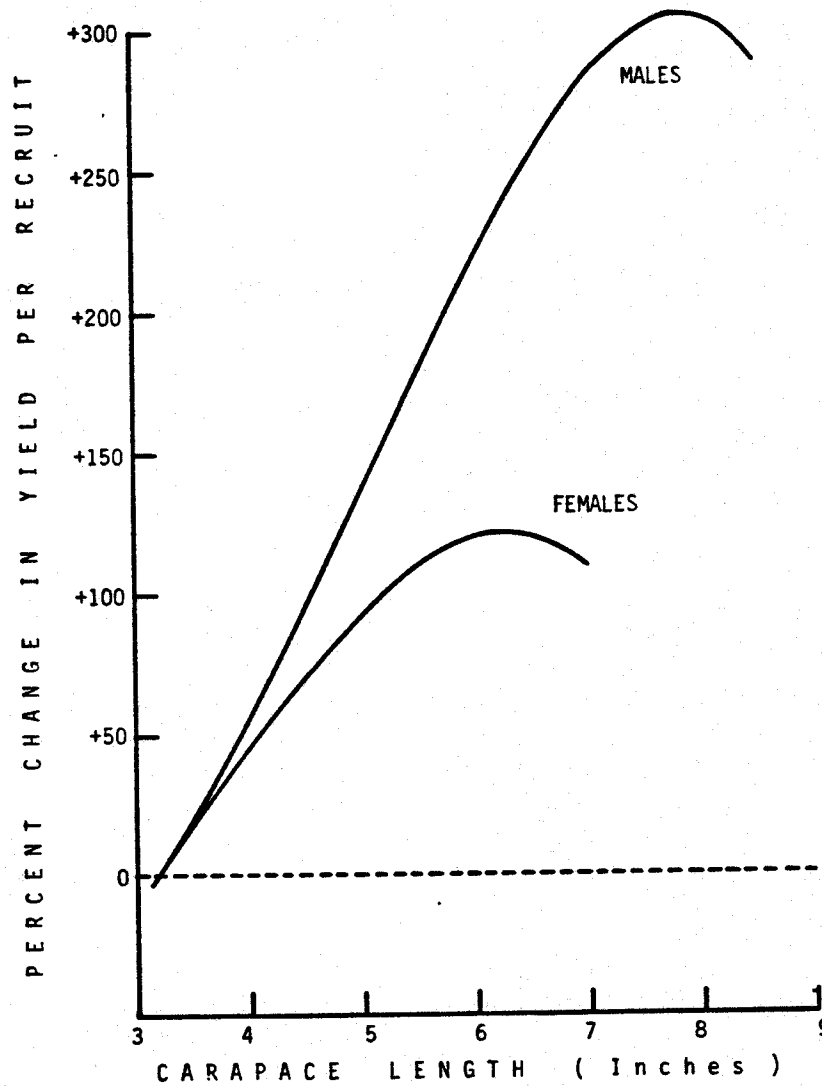


Figure V.B.5: Percent changes in offshore American lobster yield per recruit by sex associated with a wide range in minimum legal carapace lengths with fishing mortality rates held constant at current assumed levels, all relative to current conditions.

Conclusions of the Resource Analysis for Lobster Management

Based upon the biological analysis of the American lobster resource a number of important considerations having relevance to the management program may be summarized. These conclusions are cast in terms of both short-term and long-term implications relative to expected catch, resource productivity and its continued viability as a biological entity supporting an extremely valuable commercial fishery.

1. Within the regions of major production in the domestic American lobster fishery, the great bulk of landings result from exploitation of the newly recruiting year class. In other instances of commercial exploitation of marine species where such a situation has prevailed the result has often been extreme resource instability, or worse yet, recruitment failure and stock collapse. That recruitment among lobster stocks has persisted under such intense exploitation may on the one hand be viewed as a biologically fortuitous happenstance, or alternatively explained by a biological subsidy (in the form of recruitment) from outside the traditionally exploited coastal populations. Exploitation levels among offshore lobster populations are, at present, probably less than half as intensive as within the inshore populations. Should all components of the lobster resource come under equally heavy exploitation without benefit of measures to insure the reproductive potential of the stock in all areas, then the continued viability of the overall resource may be in significant jeopardy.
2. Because of a long history of very intensive exploitation in all coastal lobster fisheries, minor increases of the currently regulated minimum carapace lengths or equivalent restrictions on levels of applied effective fishing effort may have significant short-term impacts upon catch in one or more fishery components of that overall complex. Those states having a significant participation in the offshore lobster fishery may incur substantially lower relative short-term impacts from similar management restrictions because of the history of less intensive exploitation in the offshore fishery.
3. By contrast, the potential benefits from the standpoint of average long-term resource productivity which may be achieved through regulated increases in the minimum carapace length, or reductions in effective fishing effort, or a combination of both may be substantial, particularly in the offshore fishery and in segments of the New Jersey coastal fishery.
4. Current fishing practices within the coastal New Jersey fishery relating to the landing of lobster parts, a practice which is thought to primarily impact sublegal size classes, has been shown to drastically reduce the productivity that is potentially available from that resource component. Moreover, the heavy exploitation of sexually immature lobsters within the coastal New Jersey fishery is probably sustained only through recruitment from outside sources, implying that the fishery, as it is currently practiced, may be inherently unstable.

C. ECONOMIC ANALYSIS OF THE MANAGEMENT PROGRAM

An economic impact analysis of the alternative specifications of the lobster management strategy has been conducted (see also EIS Appendix 1). The economic analysis focuses on the short-term impacts of three carapace length specifications in 1985 and the elimination of sub-legal landings of lobster parts in 1984, although, other regulatory measures are discussed under (5) below. As in Section V.B. the entire lobster parts fishery is assumed to cease to exist in 1984, since the prohibition of landing lobster meats, and tails less than 1-1/16 inches at the sixth segment, occurs that year. The size restriction on tails (and claws) effectively reduces lobster parts landings to zero, as a worst case, because the entire fishery is composed of lobsters much smaller than the size that a 1-1/16 inch sixth segment implies. It becomes clear that absorbing the loss of the entire lobster parts fishery in the first year of implementation of the FMP represents the worst case in terms of economic impacts. Thus any deviation from this scenario, such as allowing a proportion of the lobster parts fishery to continue until 1986 when it is explicitly prohibited, results in lower negative economic impacts. Economic variables measured in the analysis include both prices and revenues at the exvessel and wholesale levels. All impacts relate to management measures that affect the quantity of landings and the size composition of those landings (see §V.B.).

The short-term economic analysis focuses on immediate future resource conditions (i.e., 1984 and 1985), and is primarily used in the FMP to refine the specification of the primary management measure (minimum carapace length) based upon impacts evaluated in the current resource and industry context. The analysis includes the impacts expected from the elimination of sub-legal lobster parts landings in 1984. This analysis evaluates the short-term impacts of the management program on lobster harvesters by states and the wholesale industry in general. Specific conclusions are presented below.

1. The management program effectively eliminates the landing of lobster parts, which is believed to occur principally as sub-legal landings in New Jersey, and will thus eliminate that sector of the industry that relies on sub-legal lobsters. The impacts resulting only from the effective prohibition on landing lobster parts (1984) would occur regardless of the particular carapace length selected. Thus a loss of 1,396,232 pounds and \$2,482,890 is possible in 1984. Additionally, as described above and in Section V.B., the likelihood that some proportion of these lobster parts landings would last until the 1986 deadline is remote. Nevertheless, this represents the worst case; delay in the total elimination of lobster parts landings decreases the immediate losses.
2. The primary management measure involves the establishment of a common minimum legal carapace length throughout the domestic American lobster fishery. All of the east coast states from Maine to Virginia presently have a 3-3/16 inch minimum, except for New Hampshire and New Jersey which both have a 3-1/8 inch minimum carapace length regulation. The landings and their resultant economic impacts expected in 1985 with the currently enforced carapace lengths are shown as the base case in Tables V.C.1. & V.C.2.

3. The impacts on the industry in 1985 are summarized in Tables V.C.1. & V.C.2. relative to prices and revenues, and have been discounted (using a 10% annual rate) to be directly comparable with the 1984 impacts on the lobster parts fishery (see 1 above). The differences between the two tables are due to alternative assumptions concerning size selection in the Maine fishery (Table V.B.4.), and are treated as lower and upper bound cases below.

In general it is seen that gross revenues decline and prices increase as the carapace length specification increases (for 1985). On a state by state basis, the selection of the 3-1/8 inch measure increases gross revenues for all states except New Hampshire and the Delmarva area, the latter only because the expected increases in landings are overshadowed by the price effect of total landings; a 3-3/16 inch measure results in declines in gross revenues to all states other than New Jersey; a 3-1/4 inch measure results in reductions in gross revenues to all states except New Jersey, and the Delmarva area under the alternative selection assumptions for the Maine fishery (Table V.C.2.). The reason that New Jersey landings and revenues increase at all in 1985 under carapace length increases is because the lobster parts fishery is effectively closed in 1984. Those lobsters not caught in 1984 as parts are then available for capture in 1985 at both a heavier weight and a higher price; landings and revenues of whole live lobsters in New Jersey are expected to more than double in 1985. To the extent that some lobster parts are still caught through 1986 (resulting in lower negative impacts in 1984), fewer such lobsters would be available for capture as whole live product (resulting in lower positive impacts in 1985). Notice that as carapace length increases from 3-1/8 to 3-1/4 the increase in New Jersey landings and revenues due to lobsters caught as whole live rather than parts declines significantly.

4. The most significant impact on either price or gross revenue, shown in Tables V.C.1 & V.C.2., would be associated with establishing a 3-1/4 inch carapace length. The gross revenue impact at the exvessel level of establishing a 3-1/4 inch measure in 1985 would be about a 4 to 9 percent reduction from that expected without management, depending on the assumption for fishing practices in Maine. New Hampshire would be most affected with a 43.3 to 44.2 percent reduction in exvessel revenues due to the carapace length increase alone. Maine would likely sustain the largest absolute revenue loss (over 10 million dollars) of any state with the measure specified at 3-1/4 inches, under the alternative recruitment case for Maine (Table V.C.2.). The establishment of a 3-3/16 inch measure results in the smallest impact (change) on gross revenues.
5. Three other management measures could not be quantified for analysis purposes. They include the costs of requiring escape vents and gear marking on all lobster traps deployed in the FCZ; the elimination of landings of berried females (and those from which the eggs have been removed) from the FCZ; and the observance of the V-notched lobster practice in certain FCZ waters. At the extreme, trap vents and markers would be required immediately and average material costs of

about 25¢ per trap (range: 0 to 80¢) as well as the costs of time for hauling all of the traps in order to install the vents. It would therefore seem appropriate that care be taken during the process of defining regulations; allowing for the installation of vents to be phased in would mitigate the costs of compliance, at least in terms of fishermen's time.

The prohibition on possession/landing of berried females merely extends a measure already adopted by all involved states to the FCZ. This measure will not result in any impacts on costs or forgone revenues because such catches cannot currently be landed in any state; the measure simply extends the prohibition to the FCZ to establish consistency with the states. The observance of the V-notched lobster practice would preclude landings of such lobsters from a zone extending from Maine state waters. The extent to which such landings have occurred in the past is unknown, and therefore the impacts of eliminating these landings are also unknown. If any landings of notched lobsters are lost due to the implementation of the FMP, then forgone revenues will result.

D. REGULATORY IMPACTS OF THE MANAGEMENT PROGRAM

Introduction

This section has been prepared primarily to address the requirements of Executive Order 12291, and therefore focuses upon the regulatory impacts associated with the proposed action. It is concluded that implementation of the American Lobster FMP is consistent with the general requirements in Section 2 of that document, as modified by the interim compliance procedures with E.O. 12291 issued by the Assistant Administrator for Fisheries, NOAA. This section also includes an assessment of economic impacts to assist the Assistant Administrator in evaluating the proposed management action in relation to the requirements of the Regulatory Flexibility Act.

The principal conservation measure in the lobster management program is control on the age at first capture through the establishment of a minimum legal carapace length regulation. Although this measure is expected to have an effect on the volume and size composition of lobsters landed, and thus to impact the lobster industry, the measure is not expected to affect the operational costs in the lobster fishery. Long-term resource analyses of alternative specifications of carapace length (discussed in §V.B.) indicate that the 3-3/16 inch measure provides long-term benefits in terms of the reproductive potential of the resource, as well as in terms of resource productivity as reflected in yield-per-recruit. Further increases above 3-3/16 inches show even greater long-term benefits; however, specifications in excess of 3-3/16 inches are not currently considered by the Council to be options for implementation (see §III).

Table V.C.1. Economic Impacts of Lobster Size Controls in 1985,
at 1984 Values (10% discount rate)
(Assuming knife-edge selection in the Maine fishery)

	Base	3 1/8"		3 3/16"		3 1/4"	
		Change	% Change	Change	% Change	Change	% Change
Landings (1,000 lbs.)							
Total:	37,494.0	+10,108.4	+27.0	+978.6	+2.6	-2,103.4	-5.6
Maine:							
New Hampshire:	21,071.6	+6,298.3	+29.9	0.0	0.0	-1,038.8	-4.9
Massachusetts:	637.4	0.0	0.0	-109.0	-17.1	-287.1	-45.1
Rhode Island:	8,211.2	+1,242.4	+15.1	0.0	0.0	-1,347.5	-16.4
Connecticut:	4,086.9	+456.5	+11.2	0.0	0.0	-228.5	-5.6
New York:	674.9	+230.1	+34.1	0.0	0.0	-42.2	-6.3
New Jersey:	974.8	+208.7	+21.4	0.0	0.0	-57.4	-5.9
Delmarva:	1,312.3	+1,649.3	+125.7	+1,085.7	+82.7	+911.8	+69.5
	487.4	+10.1	+2.1	0.0	0.0	-11.0	-2.3
Exvessel Prices (\$/lb.):	3.977	-0.289	-7.3	-0.028	-0.7	+0.061	+1.5
Exvessel Revenues (\$1,000)							
Total:	149,118.0	+26,413.6	+17.7	+2,812.3	+1.9	-6,237.2	-4.2
Maine:							
New Hampshire:	83,804.2	+17,121.0	+20.4	-591.4	-0.7	-2,926.8	-3.5
Massachusetts:	2,535.2	-184.6	-7.3	-448.3	-17.7	-1,121.0	-44.2
Rhode Island:	32,657.0	+2,202.6	+6.7	-230.4	-0.7	-4,946.2	-15.1
Connecticut:	16,254.6	+499.5	+3.1	-114.7	-0.7	-676.6	-4.2
New York:	2,684.0	+652.9	+24.3	-18.9	-0.7	-130.0	-4.8
New Jersey:	3,877.2	+487.2	+12.6	-27.4	-0.7	-173.2	-4.5
Delmarva:	5,219.0	+5,701.6	+109.2	+4,250.5	+81.4	+3,760.0	+72.0
	1,938.1	-104.0	-5.4	-13.7	-0.7	-15.2	-0.8
Wholesale Prices (\$/lb.):	6.985	-0.194	-2.8	-0.018	-0.3	+0.042	+0.6
Wholesale Revenues ^{1/} :	261,895.6	+61,372.2	+23.4	+6,143.0	+2.3	-13,206.0	-5.0
^{1/} Domestic Product (\$1000).							

Table V.C.2. Economic Impacts of Lobster Size Controls in 1985
at 1984 Values (10% discount rate)
(assuming size selectivity in the Maine fishery)

	Base	3 1/8"		3 3/16"		3 1/4"	
		Change	% Change	Change	% Change	Change	% Change
Landings (1,000 lbs.)							
Total:	37,494.0	+7,378.8	+19.7	+978.6	+2.6	-4,450.5	-11.9
Maine:	21,071.6	+3,567.4	+16.9	0.0	0.0	-3,386.2	-16.1
New Hampshire:	637.4	0.0	0.0	-109.0	-17.1	-287.1	-45.1
Massachusetts:	8,211.2	+1,242.4	+15.1	0.0	0.0	-1,347.5	-16.4
Rhode Island:	4,086.9	+456.5	+11.2	0.0	0.0	-228.5	-5.6
Connecticut:	674.9	+230.1	+34.1	0.0	0.0	-42.2	-6.3
New York:	974.8	+208.7	+21.4	0.0	0.0	-57.4	-5.9
New Jersey:	1,312.3	+1,649.3	+125.7	+1,085.7	+82.7	+911.8	+69.5
Delmarva:	487.4	+10.1	+2.1	0.0	0.0	-11.0	-2.3
Exvessel Prices (\$/lb.):	3.977	-0.212	-5.3	-0.028	-0.7	+0.127	+3.2
Exvessel Revenues (\$1,000)							
Total:	149,118.0	+19,811.6	+13.3	+2,812.3	+1.9	-13,494.0	-9.0
Maine:	83,804.2	+8,942.6	+10.7	-591.4	-0.7	-11,216.0	-13.4
New Hampshire:	2,535.2	-135.4	-5.3	-448.3	-17.7	-1,097.0	-43.3
Massachusetts:	32,657.0	+2,932.2	+9.0	-230.4	-0.7	-4,485.0	-13.7
Rhode Island:	16,254.6	+850.2	+5.2	-114.7	-0.7	-417.0	-2.6
Connecticut:	2,684.0	+722.7	+26.9	-18.9	-0.7	-87.0	-3.3
New York:	3,877.2	+578.6	+14.9	-27.4	-0.7	-112.0	-2.9
New Jersey:	5,219.0	+5,930.2	+113.6	+4,250.5	+81.4	+3,909.0	+74.9
Delmarva:	1,938.1	-65.6	-3.4	-13.7	-0.7	+17.0	+0.9
Wholesale Prices (\$/lb.):	6.985	-0.143	-2.0	-0.018	-0.3	+0.086	+1.2
Wholesale Revenues ^{1/} :	261,895.6	+45,124.2	+17.2	+6,143.0	+2.3	-28,245.0	-10.8

^{1/} Domestic Product (\$1000).

Short-Term Impacts of Alternative Measure Specifications

The short-term economic impact analysis (see §V.C.) is limited to the period 1984-1985, the period during which prohibition of the landing of lobster parts and the desired uniform carapace length in the FCZ lobster fishery will be implemented. The economic analysis is conducted as a comparison of three carapace length specifications (only the first two are considered to be options for implementation) with short-term effort assumed to remain at currently estimated levels. The catch forecasts for 1985, (i.e., lobster landings of 37.5 million pounds without sub-legal landings, based upon the latest available 1981 landings levels) under conditions of current carapace length control (see §V.A.), are adopted as the points of reference in this analysis. The reason that New Jersey landings and revenues increase at all in 1985 under carapace length increases is because the lobster parts fishery is effectively closed in 1984. Those lobsters not caught in 1984 as parts are then available for capture in 1985, at both a heavier weight and a higher price; landings and revenues of whole live lobsters in New Jersey are expected to more than double in 1985. To the extent that some lobster parts are still caught through 1986 (resulting in lower negative impacts in 1984), fewer such lobsters would be available for capture as whole live product (resulting in lower positive impacts in 1985). Notice that as carapace length increases from 3-1/8 to 3-1/4 the increase in New Jersey landings and revenues due to lobsters caught as whole live rather than parts declines significantly. During 1985 it is assumed that there is the potential for management control at 3-1/8, 3-3/16, or 3-1/4 inches. The analysis focuses on an economic comparison (using prices and revenues as economic criteria) of the effects of no action in 1985 versus the three carapace length specifications noted, given the elimination of lobster parts catches in 1984. A discussion of the potential impacts of the other measures and the administrative costs associated with the implementation of the FMP may be found at the end of this section.

The three possible specifications of the carapace length measure for implementation of the American Lobster FMP in 1985 are: a uniform 3-1/8 inch carapace length; 3-3/16 inches; or 3-1/4 inches. Analysis of any carapace length includes provision for eliminating the landing of lobster parts in 1984 (and the resultant increases in whole live lobster landings in New Jersey in 1985), and the combination of measures is expected to impact the landings and size composition of lobsters (see Table V.B.4). The results of the economic impact analysis (in terms of changes due to regulation at a given carapace length) are presented in Tables V.C.1 & V.C.2., and are reviewed in relation to the seven criteria set forth in the NMFS interim compliance procedures with E.O. 12291 (NMFS; June 17, 1981) below. Note that in all cases it is assumed that each of the states will comply in 1984 and 1985 with the measures as specified for the fisheries in their waters. Because this assumption may not be valid in all cases, many of the impacts presented represent maximum effects. Impacts presented as a range represent the "lower bound" and "upper bound" assumptions referred to in the preceding section for the alternative selection case in the Maine fishery (Table V.C.2.).

1. The total costs (forgone consumption expenditures) of goods and services to the national economy would likely exceed \$5 million as a consequence of 3-1/4 inch size regulation in 1985; i.e., -6.2 to -13.5 million dollars at the exvessel level (the impacts at the retail level, although not quantifiable because retail price data are

not available, should be even greater because retail prices are a mark-up over exvessel prices). The total costs to the national economy due to either the 3-3/16 or 3-1/8 inch size regulation would not exceed \$5 million; expenditures at the exvessel level would be expected to increase by 2.8 million dollars and 19.8 to 26.4 million dollars, respectively. Neither would the total elimination of the lobster parts fishery in 1984 exceed \$5 million; expenditures at the exvessel level are expected to decline by 2.5 million dollars.

2. The change in price at the exvessel and wholesale market levels would not exceed four percent (highest +3.2%) due to any of the carapace length specifications in 1985. The change in costs (forgone revenues) at the exvessel market level would be as follows: gross revenues are increased 13.3 to 17.7 percent with a 3-1/8 inch size measure; a 1.9 percent increase results from the 3-3/16 inch size; a 4.2 to 9.0 percent loss results from the 3-1/4 inch size. However, on a state by state basis New Jersey would have greater than 100 percent rise in exvessel revenues with the 3-1/8 inch carapace length regulation in 1985 (due to the assumed total elimination of lobster parts landings in 1984 and the subsequent increase in available whole live lobsters in 1985); no state exceeds the ten percent reduction limit. For the 3-3/16 inch measure, the states of New Hampshire (-17.7%) and New Jersey (about -30%; a decline relative to the expected increase in revenues at 3-1/8 inches) are expected to show losses greater than 10 percent. Finally, for a 3-1/4 inch measure, the states of Maine [-13.4%; alternative selectivity assumption only, Table V.C.2.], New Hampshire [-43.3% to -44.2%], Massachusetts [-13.7% to -15.1%] and New Jersey [about -38%; relative to 3-1/8 inches] are all expected to show significant reductions in gross harvesting revenues. Changes in gross wholesale revenues reflect the impacts from domestic landings only, because wholesale price data for lobster imports are unavailable. Elimination of the lobster parts fishery results in a 32% loss in total lobster revenues in New Jersey in 1984.
3. None of the three carapace length specifications (3-1/8, 3-3/16, and 3-1/4 inches) will restrict entry into the fishery nor impose a limited entry system nor in any way directly limit the number of U.S. fishing vessels that may participate in the lobster fishery. Although the elimination of the sub-legal lobster parts landings will remove a traditional form of fishing by a sector of the lobster industry, it will not eliminate these vessels from participating in the lobster fishery.
4. The impact on harvesting and processing employment in the lobster industry may be expected to increase with landings. Thus, increases in 1985 would be expected with the imposition of both 3-1/8 and 3-3/16 inch minimum carapace lengths, and decreases are expected with the 3-1/4 inch measure (all three include the elimination of lobster parts landings in 1984). The percentage change in employment, however, is unknown because a harvesting-employment response to landings relationship has not been quantified at this time. Further, impacts on processing employment cannot be quantified because data on processing employment do not exist, although the positive response

relationship would be expected. Alternatively, harvesting and processing employment would be expected to drop with the elimination of lobster parts landings in 1984. The extent to which such employment would shift into the whole live sector in New Jersey in 1984 is unfortunately unknown, and it is possible that it would be totally eliminated. However, much of this employment would shift during 1985 into the whole live sector with the expected doubling of New Jersey landings.

5. None of the three specifications should reduce the incentive to invest in innovative gear and equipment, except into the lobster parts sector. However, both 3-3/16 and 3-1/4 inch minimum size specifications may reduce the risk of investment due to improved resource viability and productivity, unless excessive entry into the lobster fishery is encouraged by such action.
6. Landings of lobster would actually increase by about 2.6% due to 3-3/16 inch regulation in 1985. But, landings would be expected to fall 5.6 to 11.9 percent with a 3-1/4 inch regulation. Further, landings would be expected to increase substantially in 1985 with implementation of a 3-1/8 inch regulation. All three percentage changes include the expected impact in 1985 from the total elimination of lobster parts landings. The loss of lobster parts in 1984 is expected to reduce by 1/2 (51.5%) New Jersey landings that year.
7. There are currently, and historically, negligible exports of American lobster from the U.S.

Among the other measures: the costs of installing vents and marking all lobster traps will average about 25¢ per trap, or as a probable worst case, \$556 thousand at the 1978 level of 2.224 million traps (these impacts can be reduced substantially by promulgating regulations which phase-in the vent requirement); the costs of eliminating the landing of scrubbed or berried female lobsters should be zero, because all of the states prohibit these landings already; the costs in forgone revenues of eliminating the landings of V-notched lobsters from a zone of the FCZ off the state waters of Maine (see §III for details) are unknown, because the extent to which such landings occur is unknown.

In addition to the impacts associated with the carapace length regulation, elimination of lobster parts landings, and the other measures, implementation of the American Lobster FMP will involve administrative costs such as: data collection, fishing permits, and enforcement of carapace length size measures. The National Marine Fisheries Service (data, permits, enforcement) and the Coast Guard (enforcement) are the responsible federal agencies for implementation of the plan. However, administrative costs are not expected to change due to the implementation of the Plan because: a) most of the data that would be required are currently collected or could be accommodated through planned modifications to existing collection systems; b) both NMFS and the Coast Guard already have programs for data collection, issuance of permits and enforcement, and would be unable to increase the cost of these activities due to budgetary and personnel constraints.

Impacts on Small Businesses

The implementation of the American Lobster FMP, involving minimum carapace length regulations, elimination of landings of lobster parts, trap vent requirements, prohibitions on the landing of berried, scrubbed and V-notched lobsters, as well as permit and data collection requirements, would impact most directly on lobster harvestors (vessels), and to a lesser extent on lobster wholesalers and consumers. All lobster harvestors may be considered small businesses; i.e., no one vessel is dominant in the lobster fishery. Based upon the foregoing short-term economic impact analyses, the FMP and implementing regulations would have a significant economic impact on the substantial number of small businesses that participate in the lobster fishery. There may be a redistribution of income among vessels in the fishery, especially on those vessels which currently land lobster parts, which would be eliminated (a maximum total loss of about 1.4 million pounds and 2.5 million dollars in 1984)

In the short-term, 1984-1985, the management system (minimum 3-3/16 carapace length and prohibition of landing parts) would impose some costs on the industry, primarily a reduction in landings revenues in 1984 which is slightly more than balanced with increases in 1985. In the long-term, the regime should provide positive net economic benefits to the small businesses and to the national economy, through increases in productivity (see §V.B.). Projected reporting and recordkeeping requirements affecting small businesses are those associated with the entirely voluntary National Marine Fisheries Service "Three-Tier Fisheries Information Collection System", and the independent data collection systems of each individual state. Accordingly, there would be no mandatory paperwork or recordkeeping burdens associated with gathering fishery information, except those required for the application for a fishing permit.

The number of small entities (vessels) involved in the lobster fishery is presented in Table V.D.1. The number of commercial operations involved in the inshore pot fishery may be approximately the number of lobstermen fishing, because most of these operations are one man with one boat. In the offshore pot fishery, the number of vessels and crew do not coincide, as can be seen in Table V.D.1. Trawl vessels which catch lobster also carry a number of crew. Again, all lobster harvestors may be considered small businesses. Two geographic areas are affected by the FMP, the New England Region and the Mid-Atlantic Region (New York to Virginia). Only one industry is affected by the FMP, the American Lobster industry. At this point it should also be noted that escape vents in lobster traps, as required by this FMP, would likely have no significant effect on the Mid-Atlantic's black sea bass fishery (Weber, 1981).

Any ancillary impact on lobster processors would take the form of diminished supply, higher prices and unemployment [see §V.D.(2),(4),(6)] in 1984 due to the unavailability of lobster parts. The finding of minimal economic impact, in general, on vessels landing whole lobsters, vis a vis revenue, implies a similarly minimal impact on the associated processing in 1985. Processors currently handling sub-legal lobster parts in New Jersey would lose this supply entirely, although the number of these plants and their dependency on lobster parts is unknown. Table V.D.2. presents the number of firms wholesaling and processing American lobsters.

E. RECREATIONAL IMPACTS OF THE MANAGEMENT PROGRAM

As discussed in §IV.B., there is a limited catch by licensed recreational lobstermen. Existing state regulations affecting the commercial harvesting of lobster (See §IV.D. of this Statement) also apply, where applicable, to recreational activity in Maine. New Hampshire, Massachusetts, Rhode Island, Connecticut, and New York provide regulations affecting the recreational harvesting of lobster.

Existing enforcement capabilities and resource conditions will determine the extent of the impact, if any, of the lobster management program on recreational activities for lobster.

F. INSTITUTIONAL IMPACTS OF THE MANAGEMENT PROGRAM

The American Lobster FMP is specifically designed to provide a basis for achieving cooperative and consistent management of the American lobster resource through the extension of biologically prudent management measures extant in state water fisheries to the FCZ. The American Lobster FMP encourages the non-conforming states to initiate actions which will result in consistent management regimes in both state and federal waters, thereby enhancing the overall effectiveness of the management program and contributing to sound lobster resource conservation and management.

Table V.D.1: Number of U.S. Operations in the American Lobster Fishery
1965-1976

<u>Year</u>	<u>Pot Fishery</u>		<u>Trawl Fishery</u>	
	<u>Inshore lobstermen</u>	<u>Offshore boats & crew</u>	<u>Trawls(1)</u>	<u>Crew</u>
1965	7980	0 0	88	425
1966	7560	0 0	87	414
1967	7467	0 0	137	636
1968	7850	0 0	150	711
1969	8278(2)	NA NA	140	669
1970	9398(2)	NA NA	138	633
1971	9679(2)	NA NA	119	518
1972	10218	31 211	81	346
1973	11034	34 333	64	270
1974	13663	48 328	60	270
1975	14026	66 399	54	252
1976	12490	67 420	49	199

(1) Does not include trawls landing sub-legal lobster parts.

(2) Maximum number because some of these lobstermen were involved in the offshore pot fishery.

Source: NEFMC/NEFC master file and U.S. Fishery Statistics (NOAA/NMFS CFS).

Table V.D.2: Firms Reported Handling and/or Processing
American Lobster(1) 1978

<u>State</u>	<u>Wholesalers</u>	<u>Processors</u>
California	2	--
Connecticut	5	3
Illinois	2	--
Iowa	1	--
Maine	111	16
Maryland	1	--
Massachusetts	28	12
Michigan	--	1
Minnesota	1	--
New Hampshire	2	3
New Jersey	7	2
New York	21	--
North Dakota	1	--
Ohio	1	--
Rhode Island	7	6
TOTAL(2)	190	43

(1) Does not include firms handling and/or processing sub-legal lobster parts in New Jersey.

(2) Wholesale and processing plants cannot be added, since some plants may be involved in both activities.

Source: 1978 NMFS Wholesaler Census, and 1978 NMFS Processor Census.

G. SOCIAL & CULTURAL IMPACTS OF THE MANAGEMENT PROGRAM

Implementation of the lobster management program is not expected to result in any immediate or significant social or cultural impacts on fishermen or fishing communities anywhere along the east coast of the United States, except possibly for those involved in the sub-legal landings of lobster parts in New Jersey. The decision to begin the management program with a 3-3/16 inch minimum carapace length is, in part, designed to avoid social impacts which might have occurred with a larger minimum size. In anticipation of the prescribed larger minimum size, the Council is sponsoring a major marketing study which will investigate the possible industry effects that might be associated with the landing of larger sized lobsters. Social impacts that may arise from implementation of any fishery management program are, in many cases, likely to be associated with economic considerations.

Historically, relatively few scientific studies of an anthropological nature have been completed which provide basic and comparable descriptive data (Peterson, 1977) necessary for social and cultural evaluation of fishery management plans. The data which is available from numerous individual fishing community or specific port studies (e.g. McCay's study of Shoal Harbor, New Jersey or Acheson's work on the Maine coastal lobster fishery) does not facilitate generalized social and cultural analysis of management programs capable of affecting constituencies across broad geographic regions (Peterson, 1977). In the past studies of various socio-cultural aspects of the Maine lobster fishery have been done. These studies include lobstermen's mobility (Huq, 1973), territoriality (Acheson, 1974), and response to effort control (Acheson, 1975). Only recently has baseline demographic and social information on fishermen and fishing communities along the Atlantic seaboard begun to appear in social science literature.

In December 1980, a three-volume project entitled "Mid-Atlantic Fisheries Conservation Zone: Fisheries Socio-Economic Inventory" was completed for the Mid-Atlantic Fishery Management Council. The focus of the project appears to have been to provide comprehensive individual descriptions of port fisheries, their economics, related activities and social aspects. As such, limited demographic data on fishermen is provided, except for a specific social analysis case study of Hampton Roads, Virginia.

In 1981, a major anthropological project funded by the National Science Foundation and entitled "University of Rhode Island, University of Maine Study of the Social and Cultural Aspects of Fisheries Management in New England Under Extended Jurisdiction" was published. The project's five major objectives: (a) to provide baseline data on the fishing communities and fisheries of New England; (b) to provide information on key values and social institutions; (c) to collect and analyze data on innovation in the New England fishing industry; (d) to provide a model other social scientists could use to apply social science information to problems of fisheries management; and (e) to integrate social, economic and biological information in ways that provide a coordinated picture of fishing behavior, were accomplished to varying degrees. With regard to (d), Acheson points out that:

"we quickly discovered that there was no single model that could be applied and that each management situation was unique. That is, the kinds of management schemes proposed for one fishery and the net effects they would have vary greatly with the fishery. We also discovered that social scientists could contribute greatly to fisheries management efforts, but -only through specific studies on the effects and responses to specific fisheries management schemes."

Further, although many local and subregional social and cultural studies of fishing communities now exist and which present valuable information concerning ethnicity, age, education, employment patterns, etc., what is lacking is a conceptual framework and specific criteria for evaluating such information within the established fishery management decision process. For example, it has been suggested (McCay 1981-82) that circumventing the State of New Jersey's minimum size regulation by mutilating lobsters at sea (McCay's "piscatorial piracy") by Shoal Harbor fishermen is "cultural" and "a tool of social action". It is unclear what criteria should be used when deciding whether a universally agreed detrimental fishing practice should be allowed to continue to preserve a "tool of social action" or to avert potential social and cultural impacts.

A specific study on the social and cultural effects of this lobster management program has not been done. The Council has identified the need for social and cultural studies to assist in determining the associated socio-cultural impacts of its proposed fishery management program in New England and Mid-Atlantic coastal fishing communities. The Council will endeavor to address all socio/economic issues cited during the public review of the draft American Lobster FMP/EIS.

To the extent that potential social and cultural impacts of the lobster management program would originate from economic impacts of the program, §V.C. provides an analysis of the range and distribution of likely impacts on various user groups.

VI. REFERENCES

- Acheson, J.M. 1972.
The status of socio-economic data on the Maine inshore lobster fishery. Appendix B. In: J.A. Wilson [ed.], Economic Aspects of Fisheries Management, Northern Inshore Lobster Fishery. Project Completion Report of Contract N-043-30-72. U.S. Department of Commerce. NOAA/NMFS. 1974.
- Acheson, J.M. 1975a.
Fisheries management and social context: The case of the Maine lobster fishery. Trans. Am. Fish. Soc. 104(4):653-668.
- Acheson, J.M. 1975b.
The lobster fiefs: Economic and ecological effects of territoriality in the Maine lobster industry. Hum. Ecol. 3(3):183-207.
- Acheson, J.M. 1980.
Essays on Social and Cultural Aspects of New England Fisheries: Implications for Management, 1980. Report to NSF, Vol. II, University of Rhode Island, University of Maine Study of Social and Cultural Aspects of Fisheries Management in New England Under Extended Jurisdiction. Orono, Maine: University of Maine Sea Grant Publications.
- Acheson, J.M. 1977.
"Social Data Needs in Fisheries Management Under Extended Jurisdiction", In: Establishing a 200-Mile Fisheries Zone, Office of Technology Assessment.
- Acheson, J., A. Acheson, J. Bart, J. Lello, J. Poggie, R. Pollnac, and J. Wilson. 1981. Study of social and cultural aspects of fisheries management in New England under extended jurisdiction, final report to National Science Foundation, Vols I-III. University of Rhode Island and University of Maine.
- Aiken, D.E. and S.L. Waddy. 1980.
Maturity and reproduction in the American lobster. Can. Tech. Rep. Fish. Aquat. Sci. 932.
- Andrews, P.E. 1980.
Management of the lobster, Homarus americanus, resources of the continental shelf, canyons and slopes of the northern portion of area IV and southern portion of area III. Final Report. U.S. Department of Commerce. NOAA/NMFS. Contract No. 03-4-043-359. New Jersey Div. Fish, Game and Wildlife.
- Anon. 1978
A study to determine the export and domestic markets for currently underutilized fish and shellfish. U.S. Dept. of Commerce. NOAA/NMFS. Contract No. MO-A01-78-00-4037. Earl R. Combs, Inc. Mercer Island, WA.
- Beverton, J.J.H. and S. J. Holt. 1957.
On the dynamics of exploited fish populations. Fish. Invest. Minist. Agric. Fish Food (G.B.), Ser. II, A, 533 p.

- Briggs, P.T. 1975.
Aspects of the American lobster in Long Island Sound, N.Y. Annual Report. Com. Fish. Res. Dev. Act. Contract No. 3-212-R-1. New York Dept. Environ. Cons.
- Briggs, P.T. 1979a.
Investigation of the American lobster in New York waters. Completion Report. Com. Fish. Res. Dev. Act. Contract No. 3-257-R. New York Dept. Environ. Cons.
- Briggs, P.T. 1979b.
Growth, movements and mortality rates of American lobsters in western Long Island Sound. Annual Report. Com. Fish. Res. Dev. Act. Contract No. 3-292-R-1. New York Dept. Environ. Cons.
- Briggs, P.T. 1980.
Growth, movements and mortality rates of American lobsters in western Long Island Sound. Completion Report. Com. Fish. Res. Dev. Act. Contract No. 3-292-R-1. New York Dept. Environ. Cons.
- Burns, T.S., S.H. Clark, V.C. Anthony, and R.J. Essig. 1979.
Review and assessment of the USA offshore lobster fishery. ICES CM 1979/K:25.
- Cobb, S.J. 1976.
"The American lobster: the biology of Homarus americanus." University of Rhode Island, Kingston, RI 32p.
- Cooper, R.A. and J.R. Uzmann. 1977.
Ecology of juvenile and adult clawed lobsters, Homarus americanus, Homarus gammarus, and Nephrops norvegicus, p. 187-208. In: Proceedings, Workshop on Lobster and Rock Lobster Ecology and Physiology, Div. Fish. Oceanogr. Circ. No. 1, C.S.I.R.O., Melbourne, 1977.
- Cooper, R.A. and J.R. Uzmann, 1980.
In: The Biology and Management of Lobsters. Cobb, J.S. and B.F. Phillips [eds.] Vol. II, Chapter 3, p. 113.
- Dow, R.L. 1961.
Some factors influencing Maine lobster landings. Com. Fish. Rev. 23(9):1-11.
- Dow, R.L. 1966.
Limitations on measurement of effort-yield in the Maine lobster fishery. Fishing News Int. 5(8):32-36.
- Dow, R.L. 1969.
Cyclic and geographic trends in seawater temperature and abundance of American lobster. Science. 164:1060-1063.
- Dow, R.L. 1974.
American lobsters tagged by Maine commercial fishermen 1957-59. Fish. Bull. 72(2).

- Dow, R.L. 1976.
Yield trends of the American lobster resource with increased fishing effort. MTS Journal 10(7):17-25.
- Dow, R.L. 1977.
- Relationship of sea surface temperature to American and European lobster landings. J. Cons. Int. Explor. Mer. 37(2):186-191.
- Fair, J.J. Jr. 1977.
Lobster investigations in Management Area 1: Southern Gulf of Maine. Completion Report. U.S. Department of Commerce. NOAA/NMFS. Contract 03-5-043-328. Mass. Div. Marine Fisheries.
- Flowers, J.M. and S.B. Saila. 1972.
An analysis of temperature effects on the inshore lobster fishery. J. Fish. Res. Bd. Canada. 29(8):1221-1225.
- Fogarty, M.J. and D.V.D. Borden 1980.
Effects of trap venting on gear selectivity in the inshore Rhode Island American lobster, Homarus americanus, fishery. Fish. Bull. 77(4):925-933.
- Fogarty, M.J., D.V.D. Borden, and H.J. Russell. 1980.
Movements of tagged American lobster, Homarus americanus, off Rhode Island. Fish. Bull. 78(3):771-780.
- Fox, W.W., Jr. 1975.
Fitting the generalized stock production model by least-squares and equilibrium approximation. Fish. Bull. 73(1):23-36.
- Ganz, A.R. 1975.
Development potential for a northern crab fishery in New England. New England Fisheries Development Program. Contract No. 03-4-043-320. R.I. Dept. of Nat. Res. Providence. January 1975. 12 p.
- Ganz, A.R. 1980.
Otter trawl induced lobster damage evaluation. Com. Fish. Res. Dev. Act. Project 3-279-R and 3-320-R. Final Report. Rhode Island Div. Fish. Wildl.
- Gates, J.M. and J.M. D'Eugenio. 1975.
Costs and returns of fishermen in the Massachusetts inshore lobster fishery. J. Northeast Agricultural Economics Council 4(2):195-210. (October, 1975). URI Dept. Resource Economics, NOAA Sea Grant. Marine Reprint #60.
- Halgren, B.A. 1975.
Results of tail length studies of the American lobster (Homarus americanus) as they relate to carapace length. Miscellaneous Report 15M. New Jersey Div. Fish, Game and Wildlife.
- Halgren, B.A. 1976.
Management of the lobster, Homarus americanus, resource of the continental shelf, canyons and slope of the northern portion of lobster management Area IV. Progress Report for Period 10/1/75-12/31/75. U.S. Dept. Commerce. NOAA/NMFS. Contract 03-4-043-359. New Jersey Div. Fish, Game and Wildlife.

Hancock, D.A. 1975.

The Yorkshore fishery for edible crabs (Cancer pagurus): assessment of the effect of changes in the minimum legal size. Fishery Investigations, Series II, Marine Fisheries Great Britain Ministry of Agriculture Fisheries and Food 27(8).

Huq, A.M. 1971.

Socio-economic impact of change in the harvesting labor force in the Maine lobster fishery. File Manuscript 142. NMFS. Economic Res. Div. Washington, D.C. 59p.

Huq, A.M. 1973.

A study of the socioeconomic impact of changes in the harvesting labor force in the Maine lobster industry. In: Sokoloski, A.A. [ed.], Ocean Fishery Management: Discussions and Research. NOAA Tech. Rept. NMFS Circ. 371. April 1973. pp 159-173.

Krouse, J.S. 1973.

Maturity, sex ratio, and size composition of the natural population of American lobster, Homarus americanus, along the Maine coast. Fish. Bull. 71(1):165-173.

Krouse, J.S. 1977.

Completion report of lobster tagging project. Comm. Fish. Res. and Dev. Act. Contract No. 3-228-R. Maine Dept. Mar. Res. Augusta.

Krouse, J.S. and J.C. Thomas 1975.

Effects of trap selectivity and some population parameters on size composition of the American lobster, Homarus americanus, catch along the Maine coast. Fish. Bull. 73(4):862-871.

Lackey, R.T. and W.A. Hubert [eds.]. 1978.

"Analysis of Exploited Fish Populations." Virginia Polytechnic Institute and State University. Sea Grant. VPI-SG-76-04. 97 p.

Lund, W.A. Jr., L.L. Stewart and C.J. Rathbun. 1973.

Investigations of the Lobster. Completion Report. Comm. Fish. Res. and Dev. Act. Contract No. 3-130-R.

Marine Group, Development Sciences, Inc., in association with Robert J. Harmon and Associates, Inc. 1980. Mid-Atlantic fishery conservation zone: fisheries socio-economic inventory. Prepared for the Mid-Atlantic Fishery Management Council. Vols. I-III.

McLeese, D.W. and D.G. Wilder. 1958.

The activity and catchability of the lobster (Homarus americanus) in relation to temperature. J. Fish. Res. Bd. Can. 15:1345-1354.

McCay, B.J. 1982. The Pirates of Piscary: Ethnohistory of Illegal Fishing in New Jersey. Rutgers University, New Brunswick, NJ. Manuscript.

McRae, E.D. Jr. 1960.

Lobster explorations on the continental shelf and slope off the northeast coast of the United States. Comm. Fish. Rev., 22(9):1-7.

- Morrissey, T.D. 1971.
Movements of tagged American lobster, Homarus americanus, liberated at Cape Cod, Massachusetts. Trans. Am. Fish. Soc. 100(1):117-120.
- Morrissey, T.D. [ed.]. MS 1976.
- "Review of Unpublished Lobster Growth and Mortality Data and Preliminary Assessment of Lobster Yield per Recruit." Lobster Scientific Committee. State-Federal Fisheries Management Program. NOAA/NMFS 15 p.
- New England Fishery Management Council.
Unpublished data.
- Northeast Marine Fisheries Board. MS 1978
"American Lobster Fishery Management Plan." T.D. Morrissey, Editor. State-Federal Fisheries Management Program. NOAA/NMFS. 180 p.
- Paulik, G.J. and L.E. Gailes. 1964.
Allometric growth and the Beverton-Holt yield equation. Trans. Am. Fish. Soc. 93:369-381.
- Pecci, K.J., R.A. Cooper, C.D. Newell, R.A. Clifford and R.J. Smolowitz. 1978.
Ghost fishing of vented and unvented lobster, Homarus americanus, traps. Mar. Fish. Rev. 40(5-6):9-24.
- Peterson, S.B. 1977. Remarks before the National Workshop on the Concept of Optimum Yield in Fisheries. Houston, TX.
- Peterson, S.B. and J.M. Friedman. 1977.
The Massachusetts Lobster Fishery: Model legislation and management plans. Woods Hole Oceanographic Institution. Tech. Rept. WHOI-77-5. February, 1977. 81 p.
- Russell, H.J. Jr., D.V.D. Borden, and M.S. Fogarty. 1978.
Management studies of lobster resources. Job Completion Rept. U.S. Dept. Commerce. NOAA/NMFS. Contract No. 03-4-043-360. Rhode Island Div. Fish. Wildl.
- Scarratt, O.J. 1964.
Abundance and distribution of lobster larvae (Homarus americanus) in Northumberland Strait. J. Fish. Res. Bd. Canada. 21(4):661-680.
- Schroeder, W.C. 1959.
The lobster, Homarus americanus, and the red crab, Geryon quinque-dens, in the offshore waters of the western North Atlantic. Deep Sea Res. 5:266-282.
- Silliman, R.P. 1971.
Advantages and limitations of simple fisheries models in light of laboratory experiments. J. Fish. Res. Bd. Can. 28(8):1211-1214.
- Skud, B.E. and H.C. Perkins. 1969.
Size composition, sex ratio and size at maturity of offshore northern lobster. U.S. Fish and Wildlife Service. SSR-Fish. 598.

Smith, E.M. 1977.

Some aspects of catch/effort, biology, and the economics of the Long Island Sound lobster fishery during 1976. Completion Report. Comm. Fish. Res. and Dev. Act. Contract No. 3-253-R-1. Connecticut Dept. of Environmental Protection.

Stewart, L.L. 1972.

The seasonal movements, population dynamics, and ecology of the lobster Homarus americanus (Milne-Edwards) off Rum Island, Conn. Ph.D. Thesis. Univ. of Conn. Storrs. 152 p.

Templeman, W. 1936.

The influence of temperature, salinity, light and food conditions on the survival and growth of the larvae of the lobster (Homarus americanus). J. Biol. Bd. Canada. 2(5):485-497.

Templeman, W. 1944

Abdominal width and sexual maturity of female lobsters on Canadian Atlantic coast. J. Fish. Res. Bd. Canada. 6:281-290.

Thomas, J.C. 1973.

An analysis of the commercial lobster (Homarus americanus) fishery along the coast of Maine, August 1966 through December 1970. NOAA Tech. Rept., NMFS SSRF-667, Wash., D.C.

U.S. Dept. of Commerce, Bureau of Economic Analysis. 1977.
Business Statistics, 1977. Biennial Edition.

U.S. Dept. of Commerce, Bureau of Economic Analysis.
Survey of Current Business. Vols. 57-62.

U.S. Dept. of Commerce, NOAA/NMFS.
Fishery Market News Report, Green Sheets. New York.

U.S. Dept. of Commerce, NOAA/NMFS.
Fishery Statistics of the United States. Washington, DC. 1938-76.

U.S. Dept. of Commerce, NOAA/NMFS.
Processors of Fishery Products in the U.S. 1975-78.

U.S. Dept. of Commerce, NOAA/NMFS.
Resource Statistics Branch, Gloucester, MA. Unpublished Data.

U.S. Dept. of Commerce, NOAA/NMFS.
Northeast Fisheries Center, unpublished data.

U.S. Dept. of Commerce, NOAA/NMFS.
Resource Statistics Branch, Washington, D.C., unpublished data.

U.S. Dept. of Commerce, NOAA/NMFS.
Shellfish Market Review. Current Economic Analysis S-43. Washington, DC. September 1981.

- U.S. Dept. of Commerce, NOAA/NMFS.
Wholesale Dealers of Fishery Products in the U.S. 1975-78.
- U.S. Dept. of Commerce, NOAA/NMFS.
State landings for Maine, Massachusetts, Rhode Island, New York, New Jersey, Maryland, Virginia; Annual summaries (or December issues)
Washington, D.C. 1966-80.
- Uzmann, J.R., R.A. Cooper and K.J. Pecci. 1977.
Migration and dispersion of tagged American lobsters, Homarus americanus, on the Southern New England continental shelf. U.S. Dept. Commerce. NOAA Tech. Rept. NMFS SSRF-705.
- Van Engel, W.A., M.A. Cavell, C.E. Laird, and P.A. Haefner, Jr. 1975.
Biology and management of the American lobster. Annual Report. U.S. Dept. of Commerce. NOAA/NMFS. Contract No. 03-4-043-353. Virginia Institute of Marine Science.
- Van Engel, W.A. and R.E. Harris, Jr. 1979.
Biology and management of the American lobster. Annual Report, 1978. U.S. Dept. of Commerce. NOAA/NMFS. Contract No. 03-4-043-353. Virginia Institute of Marine Science.
- Van Engel, W.A. 1980.
Maturity and fecundity in the American lobster, Homarus americanus - a review. Can. Tech. Rep. Fish. Aquat. Sci. 932.
- Wang, D.H. and C.B. Kellogg. MS 1981.
"Demand Analysis of the U.S. Live American Lobster Market." New England Fishery Management Council. Res. Doc. No. 81-LB-8.1. August 1981.
- Weber, A.M. 1981.
Black sea bass retention and escapement in vented and unvented pots. Completion Report. Com. Fish. Res. Dev. Act. Contract No. 3-312-R-1. New York Dept. Environ. Cons.
- Wenner, A.M., C. Fusaro, and A. Oaten. 1974.
Size at onset of sexual maturity and growth rate in crustacean populations. Can. J. Zool. 52:1095-1106.

VII. LIST OF PREPARERS

This Draft Environmental Impact Statement and the American Lobster Fishery Management Plan were prepared by:

Stanley Chenoweth, M.S., Maine DMR, Liaison with New England Fishery Management Council. Mr. Chenoweth currently serves as a Fisheries Biologist for the State of Maine and previously served as a consultant to the Council Staff on various plan development activities. Mr. Chenoweth is responsible for the preparation of §IV of the EIS.

John H. Dunnigan, J.D., LL.M., Deputy Executive Director, New England Fishery Management Council. Mr. Dunnigan is generally responsible for overall development and preparation of Fishery Management Plans by the Council. He is responsible for the preparation of the American Lobster FMP. Mr. Dunnigan has served with the Council for one year, and before that he served for more than eight years as NOAA Field Attorney in both the Northeast and Southeast Regions.

Louis Goodreau, M.S. (Resource Economics), Economist, New England Fishery Management Council. Mr. Goodreau is responsible for all economic data and analysis supporting Council prepared FMPs, EISs and Regulatory Analyses. He is principally responsible for the preparation of §V.C and §V.D. of the EIS. Mr. Goodreau has served on the staff of the Council since 1977.

Guy Marchesseault, Ph.D., Senior Scientist, New England Fishery Management Council. Dr. Marchesseault is generally responsible for all scientific/technical analysis and information supporting all Council FMPs, EISs and Regulatory Impact Analyses. For American lobster, he is responsible for overall development and preparation of the EIS. He participated in the preparation of EIS §IV and §V, and is responsible for the preparation of §I - §III. Dr. Marchesseault has served on the staff of the Council for six years; his principal expertise is in fishery science and decision analysis.

Howard J. Russell, Jr., M.S., Biologist, New England Fishery Management Council. Mr. Russell is generally responsible for providing quantitative biological impact analyses in support of FMPs, EISs and Regulatory Analyses. He is principally responsible for the preparation of §V.B and portions of §IV of the EIS. Mr. Russell has served on the staff of the Council for six years; his principal expertise is in fishery population dynamics.

Der-Hsiung Wang, Ph.D., former Senior Economist, New England Fishery Management Council. Dr. Wang was responsible for the technical economic analyses contained in Appendix 1 of the EIS.

Sharon MacDonald and Laurie Gronski assisted in the preparation of this document and provided valuable editorial assistance.

The Council has benefitted greatly in the preparation of the Fishery Management Plan from the assistance of the Lobster Plan Development Team. Chaired by David Borden, RI Dept. of Environmental Management, the Team is responsible for much of the background scientific information and analysis that contributed to the preparation of §IV and §V of the EIS. The following individuals participated on the Plan Development Team:

David V. D. Borden, RI Dept. of Environmental Management
Thurston Burns, NMFS, Northeast Fisheries Center
Michael Fogarty, NMFS, Northeast Fisheries Center
Bruce Halgren, NJ Dept. of Environmental Protection
Christopher Kellogg, Staff NEFMC
Jay Krouse, Maine Dept. of Marine Resources
Bruce Nicholls, NMFS, Northeast Regional Office
Howard Russell, Staff NEFMC
James Thomas, Maine Dept. of Marine Resources
Anne Williams, Staff MAFMC

VIII. LIST OF AGENCIES, ORGANIZATIONS, AND PERSONS TO WHOM COPIES
OF THE STATEMENT WERE SENT FOR REVIEW AND COMMENT

A. Federal Agencies

U.S. Environmental Protection Agency (Regions I, II, III)
Department of State
-U.S. Coast Guard
Department of Interior
 Bureau of Land Management
 Fish and Wildlife Service
 Bureau of Indian Affairs
Department of Commerce
 NOAA, Office of Coastal Zone Management
U.S. Army Corps of Engineers
Marine Mammal Commission
Mid-Atlantic Fishery Management Council
South Atlantic Fishery Management Council
Atlantic States Marine Fisheries Commission

B. State Agencies

Maine Department of Marine Resources
Maine State Planning Office (Maine Coastal Program)
New Hampshire Dept. of Fish and Game
Massachusetts - Division of Marine Fisheries
Massachusetts Office of Coastal Zone Management
Rhode Island Dept. of Environmental Management - Div. of Marine Fisheries
Rhode Island Statewide Planning Program
Connecticut Dept. of Environmental Protection
New York Division of Marine and Coastal Resources
New Jersey Division of Fish, Game and Shellfisheries
Pennsylvania Fish Commission
Maryland Dept. of Natural Resources
Virginia Marine Resources Commission
Delaware Division of Fish and Wildlife
North Carolina Division of Commercial and Sport Fisheries

C. Organizations

Conservation Law Foundation of New England
New Bedford Seafood Council
New Bedford Seafood Producers' Association
New England Fisheries Association
Rhode Island Fishermen's Association
Maine Fishermen's Cooperative Association
New Hampshire Fishermen's Association
Boston Fisheries Association
Atlantic Fishermen's Union
Chatham Seafood Co-op
New Bedford Seafood Co-op

Provincetown Co-op
Mass. Inshore Draggermen's Association
Pt. Judith Fishermen's Co-op
New England Fisheries Steering Committee
New England Fisheries Development Foundation
New Bedford Public Library
Provincetown Public Library
Commercial Fisheries News

D. Individuals

William A. Adler
Richard Allen
Robert Barlow
Richard Barry
Earl Briggs
Maynard Graffam, Jr.
Bruce Halgren
R. Woodman Harris
Bruce Kopf
Bernard Lewis
George Main
Francis Manchester
Brian Marden
Irving McConchie
Robert McDonough
Rich Miller
James D. Morgan
Christopher O. Mullaney
Leo Murphy
Raymond A. Noyes
Ted Schiller
Norman Sickles, Jr.
Wendell T. Sides
Dana Staples
Rodney Sullivan
Joseph H. Vachon, Jr.

IX. RESPONSE TO PUBLIC COMMENTS

Key Comments Received at Public Hearings on Draft Lobster FMP

(Full summaries of public hearings available at the
offices of the New England Fishery Management Council)

Riverhead, New York - October 22, 1982

- Trap vents may interfere with legitimate by-catches.
- Opposed prohibition on landing of lobster parts.
- Supported tail segment measure to eliminate landings of sub-legal parts.
- Concerned over burden imposed by Federal license requirement.

Ocean City, Maryland - October 28, 1982

- Trap vents may interfere with legitimate by-catches.
- Concerned about costs of gear marking requirements.

Red Bank, New Jersey - October 29, 1982

- Opposed to elimination of the parts fishery due to economic hardships.
- Opposed to increase in minimum carapace size.
- Concerned over impact of pollution on lobster resource.
- Concerned over lack of socio-cultural information on the impact of the lobster management program (see written comments).
- See State of New Jersey written comments.

Danvers, Massachusetts - November 1, 1982

- Opposed to landing of lobster parts for any reason.
- Support strong enforcement of management measures.

Galilee, Rhode Island - November 1, 1982

- Support for enforcement of escape vents.
- Support prohibition on landing of lobster parts.

Machias, Maine - November 3, 1982

- Suggest that a maximum lobster size be included in the management program.
- Unanimous support for V-notching.
- Support for prohibition on landings of parts.

Branford, Connecticut - November 3, 1982

- Support for strong enforcement of management measures.
- Support for prohibition of parts.
- Support for escape vents.
- Concerned that Lobster FMP does not address perceived problems stemming from 'dragging' operations for lobsters.

Ellsworth, Maine - November 4, 1982

- Support and opposition to V-notching.
- Concerned over recordkeeping requirements and federal permits.
- Suggest that maximum lobster size should be included.

Westport, Massachusetts - November 4, 1982

- Support for prohibition on lobster parts.
- Concerned over the timing of the implementation of the escape vent measure.
- Concerned over the costs and timing of gear marking requirements.

Plymouth, Massachusetts - November 8, 1982

- Opposed to V-notching program.
- Concerned that the Lobster FMP does not address perceived problems stemming from 'dragging' operations for lobsters.

Rockland, Maine - November 9, 1982

- Suggest that a maximum lobster size should be included.
- Concerned that the Lobster FMP does not address perceived problems stemming from 'dragging' operations for lobsters.
- Suggest that V-notching be required throughout the range of the resource.
- Support for strong enforcement of management measures.
- Support prohibition on landings of lobster parts.

Portsmouth, New Hampshire - November 9, 1982

- Opposed to increase in minimum carapace size.
- Opposed to V-notching measure.
- Support escape vents but urged maximum flexibility for design variations.

Portland, Maine - November 10, 1982

- Support for minimum size and escape vents.
- Suggest that V-notch measure be required throughout the range of the resource.
- Support for prohibition on landing of lobster parts.

Hyannis, Massachusetts - November 10, 1982

- Concerned that Lobster FMP does not address perceived problems stemming from 'dragging' operations for lobsters.
- Suggest strong enforcement of management measures.

Written Comments on Draft Lobster FMP/DEIS

The following is a prepared statement made by the State of New Jersey at the public hearing of the draft American Lobster Fishery Management Plan, October 30, 1982 in Red Bank, New Jersey.

29

The New Jersey Marine Fisheries Administration, Division of Fish, Game and Wildlife fully supports the general concepts[^] need for the American Lobster Fishery Management Plan. There is, however, one recommended management measure that we don't agree with. And that is the prohibition of the landing and possession of lobster parts and meats. We can find no biological justification for this prohibition, the so-called butchering-at-sea provision in the draft plan.

In Section 406, entitled General Implications of Other Alternatives, the draft plan states that, "There is no satisfactory method of relating shelled meats to lobster size." We agree with this statement and agree with the concept that there should be a prohibition of the landing or possession of lobster meat. Section 406 goes on to state, however, that "A preliminary relationship has been developed between carapace length and certain dimensions of detached lobster tails. However, prohibition on the landing or possession of mutilated lobsters is necessary to make enforcement of the minimum size limitation practical." Fishery scientists, both in New York and New Jersey, have found a direct relationship existing between the carapace length and the sixth abdominal somite or segment of the tail. Further, by employing this relationship, lobsters smaller than the suggested 3-3/16 inch minimum carapace length would be very adequately protected with a corresponding 1-1/16 inch minimum tail segment length.

Since there is a satisfactory method of relating detached tails to whole lobster size, there exists no biological justification for prohibiting the possession or landing of lobster parts.

The sixth abdominal segment is the longest of the various tail segments and it lends itself as a relatively easy measurement for both attached and detached tails. We see no justifiable reason that enforcement of the minimum size for lobster would be hampered by the use of the carapace measurement for whole lobsters and the tail measurement for detached lobster parts.

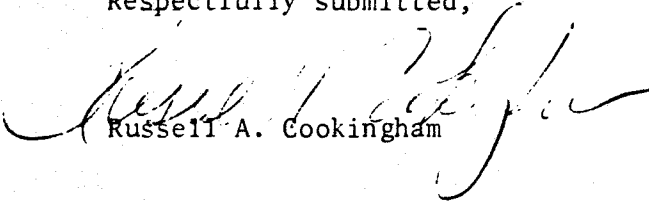
As the plan points out, the principal argument for allowing the landing of lobster parts is that dead and injured lobsters otherwise must be discarded and wasted because the thoracic portion of a dead lobster spoils much more quickly than will detached claws and tails. For this reason alone, it would seem logical to allow and encourage the landing of lobster parts, especially from the standpoint of the consuming public's health and welfare. But the rationale for allowing this practice goes beyond this. The plan states that since available evidence indicated that the occurrence of injured lobsters in trap catches is very low, and because, without a tail segment regulation, the landing of sub-legal sized lobsters would proliferate, the landing of parts should be prohibited. The plan fails to point out, however, that there is a sizable otter trawl fishery off New Jersey and in the Middle Atlantic region that has a fairly high incidental catch of lobsters. Most of this incidental

catch can only be brought to shore in parts. In most cases the harvest of lobsters in the otter trawl fisheries is incidental to a directed finfish harvest, but is nevertheless a very valuable bycatch. It can be especially valuable to the crew, since this type of bycatch is often considered as "shack", the proceeds of which go directly to the crew.

I request that the American Lobster Fishery Management Plan be modified to contain a minimum length provision of 1-1/16 inches for the sixth abdominal segment for detached tails in the Middle Atlantic area in addition to the 3-3/16 inch minimum carapace length for whole lobsters. Further, the tail segment measurement provision will not apply in any State until such time as that State has adopted landing and possession laws compatible with the fishery management plan.

Also, I should point out that this provision has been approved by the Mid-Atlantic Fishery Management Council. Thank you.

Respectfully submitted,



Russell A. Cookingham



Bruce L. Freeman

Mid-Atlantic - 9/17/82

MID-ATLANTIC FISHERY MANAGEMENT COUNCIL

ROOM 2115 FEDERAL BUILDING
300 SOUTH NEW STREET
DOVER, DELAWARE 19901-6790

TELEPHONE: 302-674-2331

DAVID H. HART
Chairman
RICKS E. SAVAGE
Vice Chairman

JOHN C. BRYSON, P.E.
Executive Director
RECEIVED

SEP 18 1982

10 September 1982

Mr. Douglas G. Marshall, Executive Director
New England Fishery Management Council
Suntaug Office Park
5 Broadway (Route 1)
Saugus, Massachusetts 01906

RE: Lobster Plan

Dear Doug:

At its September meeting the Council voted to have the Lobster Plan be modified prior to public hearing to contain a minimum tail segment length of 1-1/16 inches of the sixth abdominal segment for detached tails, in addition to the 3-3/16 inch carapace length for whole lobsters, in the Mid-Atlantic area. The tail segment measurement allowance will not apply in any state until that state adopts landing and possession laws compatible with the Plan.

If you have any questions, please contact me.

Sincerely,

John
John C. Bryson

JCB/DRK



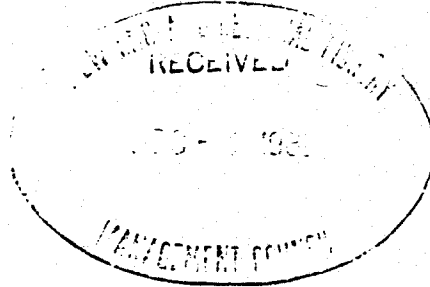
IN REPLY REFER TO

United States Department of the Interior

OFFICE OF THE SECRETARY
Office of Environmental Project Review
15 State Street
Boston, Massachusetts 02109

November 29, 1982

Mr. Douglas G. Marshall
Executive Director
New England Fishery Management Council
Suntaug Office Park, 5 Broadway
Saugus, MA 01906



Dear Mr. Marshall:

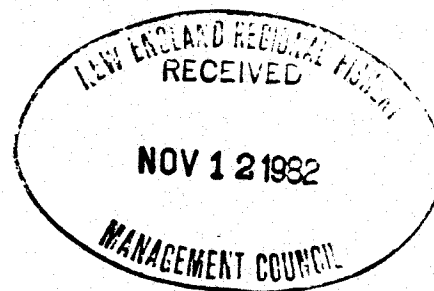
As requested, this Department has reviewed the draft environmental statement for the American Lobster Fishery Management Plan. We have no comments to offer on it.

Sincerely,

William Patterson
Regional Environmental Officer



COOK COLLEGE • DEPARTMENT OF HUMAN ECOLOGY
P.O. BOX 231 • NEW BRUNSWICK • NEW JERSEY 08903 • 201/932-9153



November 8, 1982

Mr. Alan Guillemont, Oversight Committee
Lobster FMP
New England Fishery Management Council
Suntaug Office Park, 5 Broadway
Saugus, Massachusetts 01906

Dear Mr. Guillemont:

I was asked by your colleague at the Red Bank hearings to write a version of my Statement delivered at Public Hearing, FMP for American Lobster Red Bank, New Jersey 10/29/82. The following is based upon my notes.

I am Dr. Bonnie J. McCay, Associate Professor, Department of Human Ecology, Cook College, Rutgers University, New Brunswick, NJ 08903.

First, in response to remarks made by Mr. Eric Brinks about the problem of pollution in New Jersey lobstering waters and Mr. Guillemont's reply that the issue of pollution was outside the purview of the fishery management councils, I should like to point out that the question of effects of polluted conditions upon the habitat and development and abundance of lobsters is indeed a scientific question relevant to proper management of the lobster stocks, and hence within the purview of the councils.

Second, I wish to address several problems in the Plan that raise the question of whether it meets the National Standards used as guidelines in plan development and approval. National Standard #4 includes the provision that a plan "...shall not discriminate between residents of different states." I submit that the draft plan does not satisfactorily address this provision, especially if it pertains to the avowedly much harsher impact of the plan, if implemented, upon New Jersey lobstermen, New Jersey's lobster fishery, and the wider lobster business in the state.

National Standard #2 reads "Conservation and management measures shall be based on the best scientific information available." Because of my background as a social scientist, I will limit my remarks to the question of whether the plan meets this criterion for the social, economic, and cultural sciences appropriate to the topic of lobster management, and further limit my remarks to its coverage of the Mid-Atlantic lobster fisheries. Although the plan's impact is projected to fall unevenly, primarily upon New Jersey

Mr. Alan Guillemont, Oversight Committee
Lobster FMP
New England Fishery Management Council
Suntaug Office Park, 5 Broadway
Saugus, Massachusetts 01906

-2-

November 8, 1982

lobstering, the plan provides no information on the "social and cultural framework" nor on the economics of lobstering in New Jersey, nor does it even refer to the general social and economic context of the commercial fisheries of the Middle Atlantic. The draft plan shows no evidence of attempts to obtain available social scientific information for the Mid-Atlantic region, among which is the Mid-Atlantic Socio-Economic Inventory, carried out by Development Sciences, Inc. for the Mid-Atlantic Fishery Management Council; and port inventories and descriptions published by the Center for Coastal and Environmental Studies at Rutgers University.

It may be true, as stated in the draft Plan, that standardized quantified data relevant to social and cultural features of the fishery are not uniformly available in published form for the lobstering region as a whole.

However, local and subregional studies should not therefore be ruled out of consideration and mention, especially given the projected localized impact of the plan. In addition, "best scientific information" for the social sciences is implicitly limited to published information. That practice is faulty, in my eyes, because it is routine to work closely with biologists and statisticians in the preparation of FMPs; it should be no less routine to work with social scientists who are currently engaged in research which could easily be focused or redirected to address questions raised in the plan. That such research is taking place is well known because of the dissemination of information about Sea Grant research within the National Marine Fisheries Service. I thus find it strange that I have never been approached about the possible relevance of my Sea Grant research among New Jersey fishermen, including the lobstermen identified as potentially suffering the most severe impacts of the plan.

Finally, I wish to point out some consequences of the failure of the plan to meet National Standard #2:

- 1) There is no effort, beyond crude calculations of landings and values (based on very suspect attempts to estimate unreported landings) to depict and project short-term and long-term costs and benefits of the plan for the two groups identified as most affected: New Hampshire and New Jersey lobstermen.
- 2) There is no discussion of effects on employment and social services in potentially impacted areas.
- 3) There is no appreciation of the fact that the projected costs to be borne by New Jersey lobstermen and affiliates will not be diffused throughout the state's commercial fishing communities, but concentrated in a small number of communities and among a relatively small number of fishermen. The regulatory impact of the plan is without question "significant" in New Jersey, and thus the plan requires detailed analysis of the regulatory impacts far beyond what is present in the draft.

Mr. Alan Guillemont, Oversight Committee
Lobster FMP
New England Fishery Management Council
Suntaug Office Park, 5 Broadway
Saugus, Massachusetts 01906

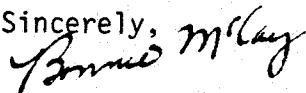
-3-

November 8, 1982

- 4) Again, since no effort seems to have been made to depict the nature of the lobster fisheries of New Jersey, beyond landings and value and fisheries biology, the plan fails to consider the impacts of the proposed management measures upon other marine resources, which may be substantial in areas such as the Mid-Atlantic where there is a high degree of mobility between fisheries and diversity of species-focus within the annual cycles of individual fishermen.

At a later point in the public hearing, I believe that I also questioned the stance taken during the hearing which amounted to a challenge to New Jersey lobstermen to provide data to justify their claims, whereas the burden of scientific proof falls upon the councils and NMFS.

Thank you for allowing me to present these views, and congratulations on running a fine hearing for these parts.

Sincerely, 

Bonnie J. McCay
Associate Professor

BJM/mcj

December 20, 1982

To: New England Fisheries Management Council

I am a full time commercial lobsterman fishing out of Bridgeport, Connecticut in the western end of Long Island Sound. Presently, there are roughly 90 full time, 600 part time and several thousand personal use lobstermen pot fishing in the Sound.

Five or six years ago, several draggers began working the western Connecticut shore from New Haven to Greenwich fishing primarily for scup. In the last two years, this fleet has grown to over twenty five vessels ranging from 45 feet to 90 feet in length. Our concern relates to the fact that these draggers have been rigging specifically to catch lobsters in the fall months of the year. Many lobstermen in our area feel that this practice will amount to the ultimate depletion of the lobster resource in Long Island Sound. The average catch of these vessels is from 400 to 500 lbs. of lobster a day with some catches reported as large as 2500 lbs. of lobster a day. Because of their size, they are not hampered by bad weather and thus are able to fish every day of the week.

In addition to the tremendous increase of lobsters being taken, it is our opinion, that the short lobsters and egg bearing lobsters being culled out and thrown back by draggers may be damaged. We base this on the fact that the quality of the lobsters they do land is poor in comparison to pot caught lobsters. Lobster dealers in our area report that lobsters purchased from draggers must be sold immediately, due to the fact that roughly one third will die if kept longer than a day or two in holding tanks. Also, draggers have been fishing right through the fall shedding season, marketing up to 200 lbs. of shedder lobsters along with the hard shells with reports of the crushed and broken shedder lobsters being dumped overboard as unmarketable. Further compounding the problem, is the fact that several of these draggers come from the State of New Jersey. Two of these vessels have been boarded and Captains arrested when they were found to have shorts and egggers on board. They were also observed dumping boxes of lobster parts, an illegal act, as law enforcement officials approached.

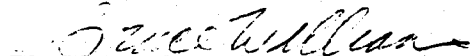
Many of our concerns are echoed by local sport fishermen who feel that draggers are causing depletion of finfish stocks in western Long Island Sound. Since Long Island Sound is considered a spawning ground for many species of finfish, the sport

fishermen are justifiably concerned that the draggers will seriously deplete the finfish resource as well as the lobster resource.

Recently, I spoke with Bob Barlow of the Massachusetts Lobstermen's Association about our problem. He informed me that a similar situation existed in the Massachusetts fishery and that he was pressing for a provision in the New England Fisheries Management Plan which would prohibit landing of dragged lobsters. I have included a list of lobstermen in our area who would wholeheartedly support such a position. This is just a partial list and we are now in the process of gathering more support not only from lobstermen but from area sport fishermen and party boat operators. Most of our local lobstermen support measures proposed by the Management Council such as the mandatory escape vent, 3 3/16" gauge limit for all states and prohibition of landing of lobster parts. We urge you to further add to this plan, a ban on the landing of dragged lobsters in the areas under your control.

Any help we can provide will be gladly offered. If you wish to contact us on this matter, please call Bruce Williams at (203) 366-0547 or Chris Stapelfeldt at (203) 866-0097.

Most sincerely,


Bruce Williams
154 Seabright Avenue
Bridgeport, Connecticut 06605

In favor of stopping dragging for lobsters in ct. waters

- R.J. Vira Jr. #415 171 Hubbard Ave Stamford Ct
- David Edgum 71 Orchard Place Greenwich, Ct.
- Arthur Rodin 45 W. Norwalk Rd.
- Jeff Sme 6 West 8th Court Norwalk Ct.
- Gustav J. DeWitt 61 Orchard Place Greenwich, Conn.
- Pete Piacentini 2916 Coddington Ave
- Bruce Williams 152 Seabright Ave Bridgeport Ct
- Henry Lemay Waters Ct Norwalk Conn 06605
- John Bourney 25 DAVES LA SOUTHPORT CT.
- Anne Wokanov Box 669 Southport Ct
- John R. Vartico 61 Orchard Pl. Greenwich Ct.
- John Tofu 173 Maple St Stamford Conn.
- Albert W. Hamington 21 Walling Ave, S.V. 11560
- John L. Herbig 7 ROBERT RD Bayville N.Y. 11709
- Bill Fossard 14 Old Wagon Rd Old Greenwich Ct.
- Peter Volkmar P.O. BOX 15 MO. Milford Ct 06460
- Eugene Karbanski 139 Cedar Heights Rd STAMFORD CT.
- Tom Virech 11 Bluff Rd Rowayton Ct.

Frank P. J. 46 MERO AVE GREENWICH CT.
Ronald Kravitz 141 Vine St. Stamford
Nicholas DeGenaro 154 Seabright Ave Ept. Ct 06605
Christopher Stoppelfeldt 65 Walport Rd Willton Ct 06897
Vern Geener 28 Woolly La. West Haven Ct. 06516
Larry Probstock Milford, Ct.
John Orso West Haven Ct 06516
James Hunter 39 Hiawatha La Westport, Ct 06880
Stanley Nabolny 32 Blaine St. Fairfield, Ct. 06430
Donald Roos 171 Chestnut Hill Rd. Norwalk, Ct. 8473273
Carl Ford Southport Ct. 06430
Chris Ford Tomac La. Old Greenwich, Ct 06870
Bill Carlson 30 Linway Rd. Cos Cob, Ct.

COUNCIL RESPONSE TO PUBLIC COMMENTS

The Council held fourteen public hearings in the New England and Mid-Atlantic areas in later October and early November to receive public comments on the Draft Lobster FMP. In addition several written comments were also received during the formal comment period. On December 21 and 29, 1982, the Council's Lobster Oversight Committee reviewed all comments on the Draft Lobster Plan and developed recommendations concerning appropriate revisions to the lobster management program. On January 11 & 12, 1983, the full Council reviewed the recommendations of the Committee and adopted all of the major recommendations which are presented below. In addition, the Council delegated to the Lobster Oversight Committee the authority to approve non-substantive and editorial revisions to the Final Lobster FMP and EIS made by Council staff. The Council believes that all public comments, oral and written, have now been addressed.

Minimum Size and Landing of Parts

The public comment was very much in favor of the 3-3/16 inch minimum size and the prohibition on the landing of parts. The major problem areas, as the Draft FMP noted, would be in New Jersey and New Hampshire. The Mid-Atlantic Council and the State of New Jersey argued for allowing the landing of lobster tails of a certain minimum size compatible with the 3-3/16 inch carapace length.

The Committee considered these matters together since in the area where they present problems they are really different sides of the same coin. The State of New Jersey made a strong statement that there is now a good chance for some positive movement in the New Jersey management program, but only if there is some ability to allow the practice of landing parts, even if they must come from otherwise legal-sized lobsters.

The Committee discussed phase-in procedures, call-in procedures for special cases, particularized exemptions and other matters. Many of these got very complicated. In the end, Committee members believed that some progress could be made by somehow accomodating the State of New Jersey, and concluded that the simplest and best way to do it would be to delay the implementation of the minimum size and parts prohibition. The Committee arrived at January 1, 1985, as appropriate for the minimum size provision and January 1, 1986, for the parts prohibition. However, upon initial implementation of the Plan the minimum size for lobster tails would be as suggested by New Jersey and the Mid-Atlantic Council (1-1/16 inches long in the sixth abdominal segment of the tail); only two claws per tail would be allowed; and landing or possession of lobster meat would be flatly prohibited forever, from the beginning. The Committee believes that, while there are no guarantees when dealing with legislative processes, the proposed timing of these measures will enable the State of New Jersey to implement a compatible management program.

Therefore the Lobster Oversight Committee recommends that the following language be included in the final FMP:

Minimum Size:

Beginning January 1, 1985, the possession or landing of American lobsters with a carapace length smaller than $3\frac{3}{16}$ inches shall be prohibited.

Mutilated Lobsters:

Upon Plan implementation, the landing and/or possession of lobster meat shall be prohibited. Until December 31, 1985, the landing or possession of lobster tails with a sixth abdominal segment smaller than $1\frac{1}{16}$ inches shall be prohibited, and only two claws per tail may be possessed or landed. After January 1, 1986, the landing or possession of lobster parts shall be prohibited.

V-Notching

The V-notching proposal received enthusiastic support in Maine, and was generally greeted ambivalently in other areas. There was opposition in New Hampshire, and some concern expressed in Massachusetts. Otherwise, the reaction outside of Maine seemed to be: it is alright as proposed since it will not affect our fisheries, but don't extend it into our areas.

This remains among the most contentious of the issues in the Lobster FMP. On the one hand, Maine fishermen appear to believe in it, and they do constitute at least 60 percent of the fishery. Management programs should be responsive to the desires of the industry, and impacts in other areas have been minimized by limiting the area of the program. It was argued that disregarding the Maine fishermen's principal concern in the Plan would hurt the Council's credibility and jeopardize continuing cooperation on future necessary management of the lobster resource. On the other hand it is argued that there is no good proven reason to implement this measure, and that regulations should not be implemented unless their value can be proved.

After spending much time with this issue the Committee came to the conclusion that the measure taken to public hearing was a reasonable compromise between some strongly-felt positions. No better alternative for resolving these positions has been suggested. The Committee believes that the measure should be in the Plan in order to support a State management measure that is strongly endorsed by that state's industry which constitutes at least 60 percent of the fishery, under circumstances that minimize the potential adverse impact in other areas. Some biological arguments can be made in support of the measure, but its greatest value is in the support it gives to the Maine management program. The Committee therefore recommends that no change be made in the V-Notching provision in the Plan.

Trap Vents and Gear Marking

Public comments and discussions in the Oversight Committee brought out the effects a vent requirement would have in the fishery off Southern Long Island. However, comments at many hearings also raised concern about the length of the transition period to put new gear into service which would meet the requirement. The Oversight Committee believes these problems can be resolved by delaying the implementation of this measure to coincide with the implementation of the minimum size. For Southern Long Island, the Regional Director should be able to consider the particular needs of that fishery in approving alternative vent configurations. More research is necessary in the development of pot gear with vents which will allow the escapement of undersized lobsters but retain by-catch. Gear marking, which is included to support enforcement of the vent requirement, needs to be added to the Plan (it was only in the regulations in the public hearing draft), with costs detailed.

The Lobster Oversight Committee recommends the following revisions to the Plan:

1. the vent and gear marking requirements be implemented on January 1, 1985; and
2. in allowing alternative vent designs, the Regional Director should consider the problem of allowing for retention of by-catch.

Trawl Harvests

The Council did not include a provision addressing trawl harvests in the draft FMP. Nonetheless, the issue came up at a number of public hearings and in the NMFS comments. A number of States already have regulations on trawl harvests. The Committee believes that the Council has little basis to go on right now, but that this is an area with which we will have to deal in the future. The Lobster Oversight Committee recommends that the question of trawl harvests be addressed in the Plan under items for continuing consideration for future management.

Enforcement

The Lobster Oversight Committee recommends that the language of the prohibitions in the proposed regulations be simplified to eliminate references to jurisdictional limitations and reflect the Council's intent that the minimum size be applied throughout the range of the species.

Gear Conflicts

A number of people at the public hearings were confused by the gear conflicts language in the Plan. Some believed that the Council would impose gear conflicts regulations without further comment on the basis of the language in the draft FMP. The Council's intent was only to alert fishermen to the fact that there is a gear conflicts amendment in preparation which, when final, will affect lobster fishing.

The Lobster Oversight Committee recommends that the language of the Plan be clarified to indicate that this Plan does not deal with gear conflicts, although there is a separate administrative procedure under way which may in the future lead to gear conflict regulations.

Berried Females

Some public comment raised the fact that in some areas, at certain times of the year, aggregations of berried female lobsters seem to be prevalent, and that some sort of area spawning closure might be appropriate. The Committee concluded that this matter should be looked into further. There was virtually no opposition to the prohibition on possession of berried females, or to the prohibition of scrubbing berried females.

The Lobster Oversight Committee recommends the potential of seasonal area closures to protect berried female lobsters be highlighted as an area for further research and future consideration in management.

Editorial Revisions

The Lobster Oversight Committee recommends that the staff be authorized to revise the Plan in presentation, but not substance, in order to resolve issues raised by these comments.

Other Matters

There were a number of other issues which arose during the course of public hearings which did not receive a lot of attention, and which the Committee has judged do not require any change from the draft FMP. In Maine, for example, there was some sentiment expressed for the maximum size limit, although it was clearly not considered as critical as the V-notching measure. In Massachusetts there was some concern expressed about proliferation of gear and a call for looking into a limitation on the number of traps that were being fished. In New Jersey many complaints about pollution were aired. Although these are important issues, the Committee thinks the Draft FMP handled them appropriately.